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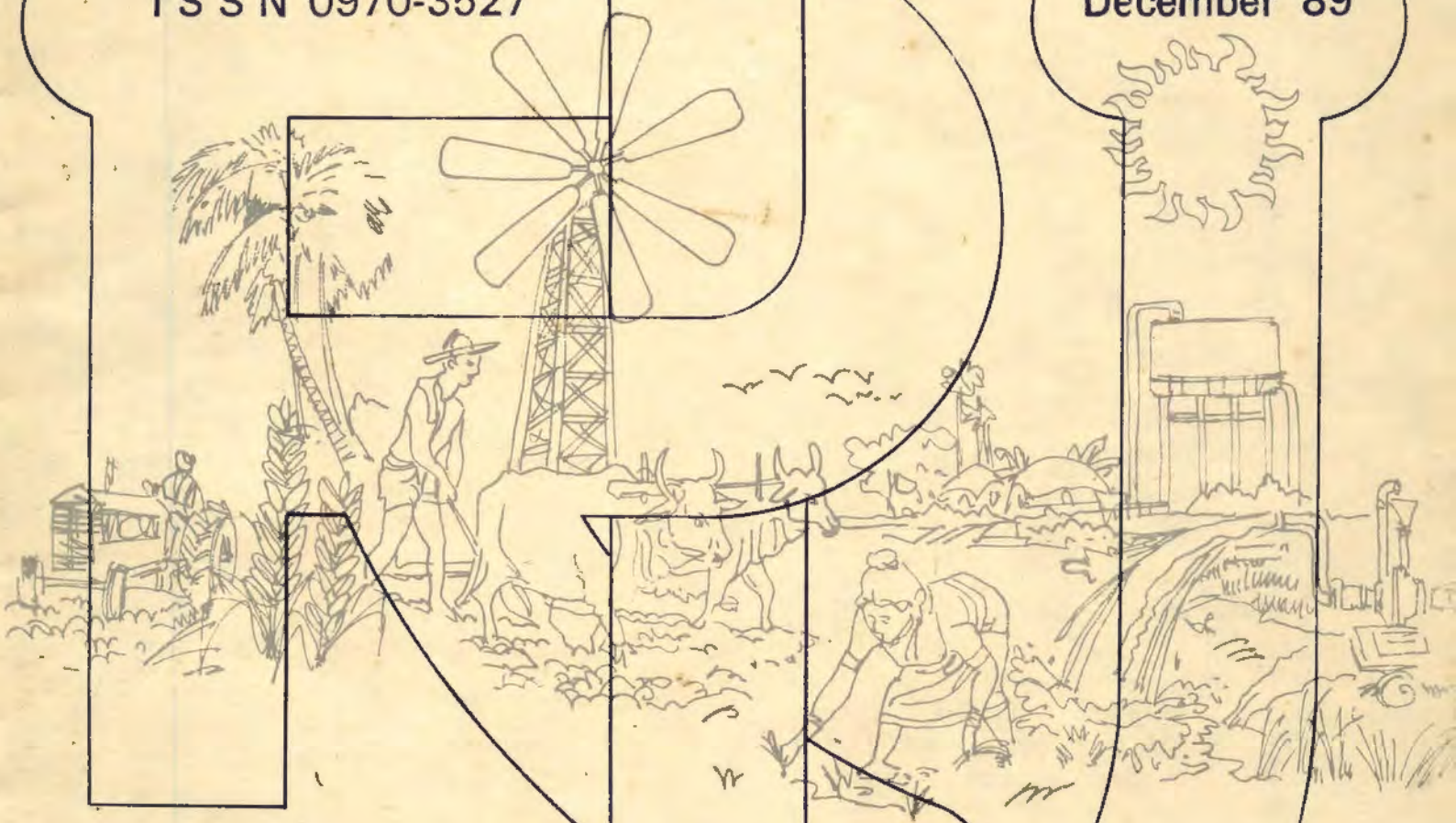

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CONTENTS

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Editorial

The need of policy support for developing the rural economy through judicious application of technology has never been so critical as now. The reverse trends, as outlined in these columns over past five years, have been borne out amply by rapidly changing industry - technology - development scenario. Future seems to be mortagaged in the hands of mega Industrial tycoons, indigeneous and imported both. All sectors of economy, including agriculture, are fast being brought into the clutches of these powerful money-bags. Salt the meanest of the taste giver for a frugal meal, for which Mahatama Gandhi led the epic Salt Movement during British regime and thousands bore brutal injuries, has been silently handed over to one of the biggest industrial house in the name of iodised salt. No eyebrows have been raised, not even a whisper heard even amongst scientific community (as was the case of fluoride tooth-paste) regarding the fact that one needs iodised salt, if at all, only in controlled quantities where really iodine deficiency is causing health problem. Thus besides mortagaging socio-economic interests these actions pose, serious threat to public health and well-being of the society. The subtle maneouvers and cunning ways of big money powers will defeat even a modest effort of decentralised production of commodities of mass consumption if such effort is not well though out and well gaurded, sealing the possibility of progressive movement towards fully decentralised economy based upon appropriate production technologies.

The most outstanding example of such a meneouver, recognised even by the Govt., is that of proliferating powerlooms. While the number of authorised powerlooms is estimated at 6.5 lakh. the number of unauthoried ones is reported to be around 3.5 lakh. the latter causing huge excise duty evasion and violation of labour laws. Large textile mills have also transferred their sophisticated looms to the powerloom sector cornering all economic benifits, otherwise meant for larger section of small scale entrepreneurs.

Thus the point is evidently clear that lacunae in policy framework, inadequate or no monitoring and collusion of the administration are good enough to put at naught the best of the decentralisation processes or technology ownership by the masses for satisfaction of basic needs. So the issue central to this problem is who are the policy makers ? Do they represent real interest of masses as articulated by the latter ? Do they ensure that the real interests are well administered ? If not so then the people must find answers or alternatives which will best serve their interests and should not be swayed what is fed to them by those who own centralised means of production or governance.

Publication List, 1989

1. Rural technology : Report of National Seminar, 1981, 20 papers on Rural/Appropriate Technology.

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2. Renewable Sources of Energy : Proceedings of Short Term in Service Training Programme, 1983, 20 papers on Solar Cookers, Smokeless Cookstoves, Micro Hydro Power, Wind Energy, Biomass and Biogas etc.

   English pp 250 Rs. 200/-

3. Selection of Windmill and Agricultural Pumpsets : Course manual of Training Programme for Senior Officers of NABARD, 1984, 3 papers on Water Pumping Windmills, Special features : Paper on agronomic aspects of Windmill Irrigation.

   English pp 39 Rs. 30/-

4. Course Synopsis of ISTE : Summer School on Renewable Sources of Energy. 1984, 12 Papers on Biomass, Biogas, Wind Energy, Solar Energy and Micro Hydel sets etc. and 4 project reports on Solar Water Heater, Solar Cooker and Biogas plant.

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8. Course synopsis of ISTE : Manual of Training Programme on Renewable Sources of Energy for Project Officers of Non-Conventional Energy Development Agency, Government of Uttar Pradesh, 1987. 13 papers on Biogas, Biomass, Solar energy, Cookstove, Human and Draught Animal Power, Aero Generator etc.

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ANALYSIS OF PROBLEMS FACED DURING EXTRUSION COOKING ON A LOW CAPACITY INDIGENOUS EXTRUDER

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Soybean Processing & Utilisation Project CIAE, Bhopal

& P.K. Chattopadhyay & R.K. Mukherjee
Indian Institute of Technology, Kharagpur

A study was conducted to evaluate the performance of low capacity indigenous extruder. Various feed rates (6, 8, 10 kg/h) mositure contents (20, 24, 28, 32%), cooking temperature (145, 150, 155°C) pressure (25, 35 kg/cm²) and screw speed (60, 70, 80 rpm) were attempted for exitrusion cooking. The optimum operative conditions were 8 kg/h feed rate, 28% m.c. (wb), 150° C cooking temperature, 35 kg/cm² pressure, and screw speed of 60 rpm. The processing cost was Re 0.74 per kg of extruded project. During the study problems were faced on account of mechanical and operational shortcomings. These problems have been analysed and suitable remidies suggested.

Introduction

Extrusion cooking is believed to be an important food processing technique for preparation of nutritious foods at relatively low cost. In the past, some works were done by various researchers on high cost imported large scale extruders. In view of their large capital investment and infrastructual requirements to handle the products, they could not reach the vulnerable groups (Mukhopadhyay 1976, Gupta 1976). Therefore an attempt was made on an indigenous extruder for its suitability as a small scale unit to produce nutritious ready-to-eat snacks at rural level.

The important processing parameters to get uniform operation of extruder are feed-rate, moisture content of feed, temperature of barrel and screw speed. General problems encountered during the operation of extruder are directly related to variation of these parameters from the desired level which affect the quality of the product. The most common mechanical problems are jamming and choking of the plasticised food material inside the barrel which makes it difficult and time consuming operation to clear the unit. The paper discusses test results, problems during operation and their probable solutions.

Materials and Methods

The extruder used for the study has compression ratio of 3:1, L/D ratio 20 : 1,. rpm range 50 to 100, pressure range maximum upto 350 kg/cm², motar H.P. 3, 3 phase, 1440 rpm (Fig.1). In order to get maximum desired barrel temperature of 200° C, four band heaters with 250 W coil each were used. The set up was calibrated for relationship among feed rate, speed and retention time (Fig.2). Iron constantan thermocouples were used for measuring the rise in the temperature of material and the barrel. The pressure was measured just before the die with the help of bourden tube pressure gauge connected through a hollow steel rod filled with silver grease. The energy consumed during the operation was measure with the help of suitable energy meters.

Following three combinations of parboiled rice (sitasal fine) soybean (JS - 72 - 44) and sugar conditioned to different moisture

contents (32, 28, 24 and 20% wb) were used in their ground and unground conditions.

Granularity		Ingradients combinations (%)		
20 mesh	40 mesh	Parboiled Rice	Soybean	Sugar
I	IV	64	24	12
II	V	60	28	12
III	VI	53	32	15

The various extruded cooked products in the temperature and pressure ranges of 140-160^{o} C and 25-35 kg/cm^{2} respectively were served to test panel for its sensory evaluation. The proximate analysis and storability of the accepted product were also studied.

Results and Discussion

It was observed that extruder functioned well with ground sample at all the moisture contents except 20% wherein choking took place. The unground samples did not yield satisfactory result at any of the moisture contents. This could be due to non-uniform particle size distribution as well as unavailability of adequate pressure and uniform heating. It was observed that the expansion ratio (Ratio of diameter of extruded product to the diameter of the die) increased with increase in the moisture content (Fig.3). This was found to be in good agreement of Zuilichem et al (1975) study on maize. However, the extruder had a tendency to choke at 32% moisture. It was also found that decrease in the die opening appreciably increased the expansion ratio (Fig.3).

The percentage of soybean was restricted to 32% because of its reported adverse effect on human digestive system beyond this level. However, undesired antinutritional factors whatsoever present in the sample were inactivated under the operating range of temperature (140 to 160^{o} C). This is in good agreement with Cumming et al, 1979 and Harper, 1979. In this temperature range the nitrogen solubility index of the product was in the range of 24.21 to 22.78 which is well within the acceptable limit.

When the moisture content of 20 mesh size sample increased from 24 to 32% the specific energy consumption decreased from 0.64 to 0.54 kWh/kg of feed. Similarly incase of 40 mesh size for the increase of moisture content the energy decreased from 0.63 to 0.51 kWh/kg of feed. This is indicative of the fact that as the particle size of feed decreased and moisture content increased the specific energy consumption decreased.

Analysis of problems encountered during extrusion

During the experiments various problems were faced. One of the major problem was frequent choking and jamming of extruder. It could be due to various reasons. The improper feed rate i.e. the quantity of material present in the feed hopper affected the output. Sometimes the blockage at the hopper's outlet affected the feed rate. While clearing the blockage of material in hopper, use of metallic rod was avoided because it might damage the screw severely if somehow got into its flights. The fluctuations in power supply which is quite prevalent in Indian conditions also affected the extruder operations in terms of rpm of the screw, temperature, the flow ofmaterial within the screw flight and barrel and thus the project output. This also causes surging problem. In addition uneven flow of the product through the exit and escaping down of the formed steam during high temperature extrusion towards the feed hopper also caused surging problem. Lack of sucking ability in the feed section and insufficient pressure generated inside the barrel could perhaps not force the food material for its onward smooth flow. The non-uniformity in heating as well as in particle size of the food material and the gelatinization of starch component of rice

in the mix also contributed toward these problems. The segmented band heater caused large thermal gradient even within the small length of the barrel.

The moisture content of the feed had significant influence on choking. It was found that moisture content of 20% and/or below as well as 32% and/or above caused frequent choking. The condensation of flow back steam towards hopper disrupt the compected food in the channel. It causes increase in moisture content and momentarily reduces the discharge from the extruder. Thereby causing plasticizing effect and poor flow-ability within the screw flight and barrel.

These problems required tedious and lengtly methods for cleaning and barrel and screw. The oily seeds like mustard did help overcoming this problem sometimes but mostly the extruder had to be flooded with pouring it through the feed hopper. This softens the material and makes the screw rotate on operation. This process of flooding with water posed another problem due to water entering into the thrust bearing and leading to mechanical breakdown. It could be added here that jamming/choking and other associated problems caused significant loss of human and mechanical energy and time besides excessive wear and tear of the machine.

The measurement of pressure with the help of Bourdeen-tube pressure gauge connected through a hollow tube filled with silver grease was problematic. This was due to frequent choking of tube with dried food material.

The total cost of extruding one kilogramme of feed employing this indigenous exrtruder worked out to be Re 0.74. When compared with the commercial large capacity extruders it was quite higher. This was mainly due to above mentioned problems alongwith its low-capacity and high energy consumption. The energy consumption could be reduced significantly by providing suitable insulation on band heaters and the barrel. The energy consumption in large commercial units ranges between 0.50 and 0.36 kWh/kg of feed whereas in this design the consumption was as high as 0.59 kWh/kg at which the product was considered suitably cooked.

The help solving problems of choking and avoid possibilities of break-downs, provision of nut and bolt arrangement with flange in the barrel should be made. It would further help in easy cleaning, dismentling, assembling, clearance settings and thus maintaining sanitory conditions. To clean up the extruder after removal of die the screw must be started so that remaining material in the channel can be augered out. Also to facilitate cleaning dry grit or whole soybeans are feed with open discharge to aid in pushing out any remaining material and cleaning the screw channel. The barrel could be split so that they are hinged open quickly exposing the screw. Sometimes the barrel be pulled out and washed in boiling water.

To get uniform heating the extruder barrel should be provided with continuous heating coil around its periphery all among, its length. Provision of thermostat to control the temperature in the barrel should also be made. Feed section of the screw be modified for its less root diameter to improve its sucking ability. Mechanical feeding should be done with positive drive mechanism.

Surging problem can sometimes be stopped by cooling the barrel or the jacket at the feed section. Also temporarily cooling the discharge end of the extruder and/or increasing the feed rate will reduce this problem. If done so, probably extruder temperature will get reduced and would allow the screw to properly refill with the food and return to normalcy. The bourden tube pressure gauge be repalced with a pizo--electric quartz crystal sensors to avoid the frequent choking of the connecting tube between barrel and gauge becasue they have the advantage of small size and no liquid filling (Harper 1979).

Conclusions

A low capacity indigenous extruder was

evaluated for its performance. The optimum condition for operation were 8 kg/h of feed rate, 28 % moisture content of feed, 150° C cooking temperature, 80 rpm screw speed and 35 kg/cm^2 pressure. The cost of extrusion was Re 0.74 per kg which was at higher side due to problems of choking and jamming etc. These could be overcome incorporating suggested measures and a technologically superior and economically viable low cost indigenous extruder can be made to suit to small scale industry and help solving the malnutritional problems of rural India.

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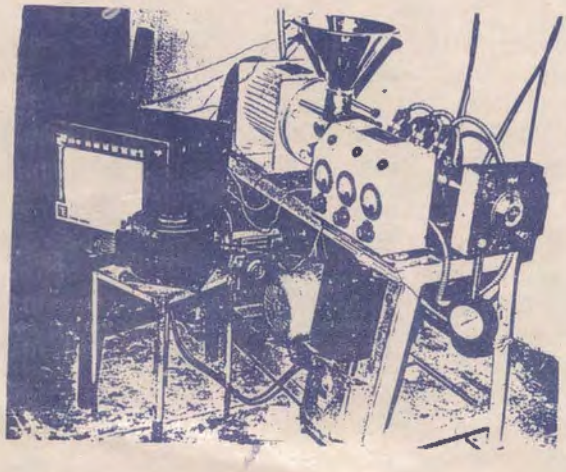
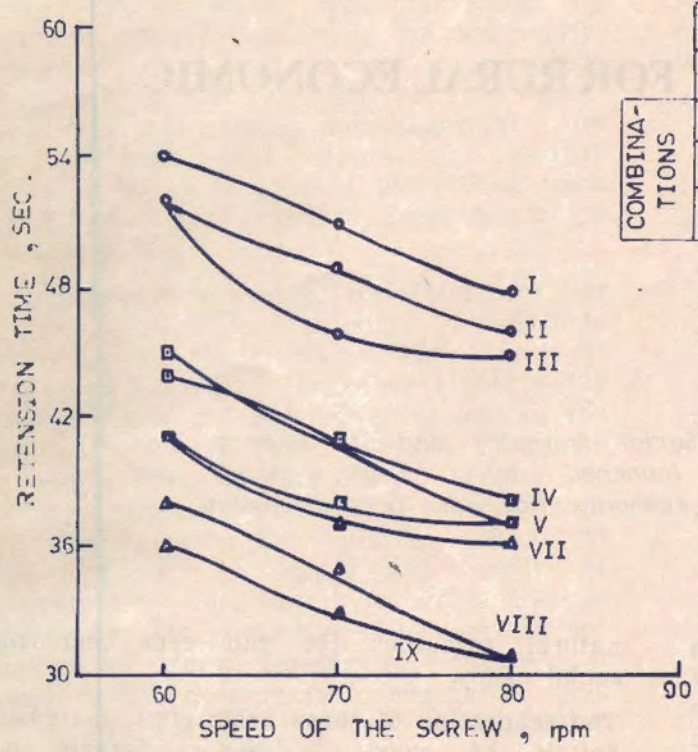
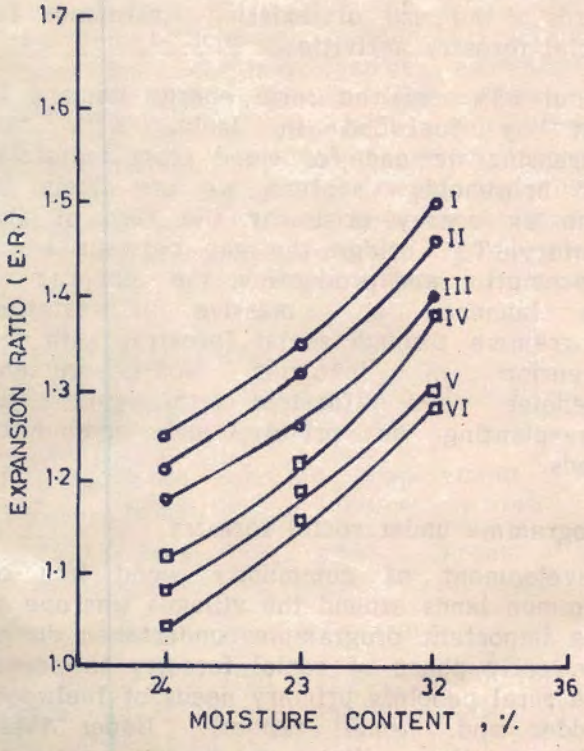


Fig. 1 : Experimental set up on the Low - Capacity indigenous food extruder.



	FEED RATE Kg/hr.			INGREDIENTS (%)		
	6	8	10	Parboiled rice	soybean	sugar
COMBINATIONS	I	IV	VII	64	24	12
	II	V	VIII	60	28	12
	III	VI	IX	53	32	15

Fig. 2 : Retention time at different feed rates and speeds (rpm) of three different cominations at 28% moisture content and at cooking temp. 150° C.



	DIE ϕ		INGREDIENTS (PERCENT)		
	1.5 cms	2.5 cms	Paboiled rice	soybean	sugar
COMBINATIONS	I	IV	64	24	12
	II	V	60	28	12
	III	VI	53	32	15

Fig. 3 : Effect of moisture content of the feed and dia of the dia on expn. ratio (ER) of extruded samples of different combinations.

(ii) Underground water potentiality

Deep bore wells and other drilling devices in the semi arid zones are highly cost oriented. Profuse growth of trees on all possible lands can widen the underground water table. Distributed tree growth has water harvesting and recharging capacity. It is necessary to maintain tree on the catchment areas to regulate flow of water throughout the year for irrigation.

(iii) Control of Diseases

A viable social forestry programme can build diverse vegetation to lead towards a stable environment.
Neem like trees provide natural products which work as insect repellents.

Diverse vegetation through social forestry helps in

(i) Providing multivitamins from wild fruits.

(ii) Controlling spread of diseases.

(iii) Reduces pollution of air, water and soil.

(iv) Fodder production

To produce a sufficient quantity, there is need to enhance fodder trees under social forestry programmes. This will create a more congenial agro-climatic conditions.

(v) Fruit trees

To increase the food value in the rural areas, the barren lands have to be made fertile with the trees which can provide fruits. These nutritious fruits will be available free of cost to the poor people.

(vi) Honey bee rearing

Apiary is also an important component of social forestry. Distributed tree growth in the farming land will provide pollen for the honey bees.

The above components of social forestry directly contribute to improve the socio-economic conditions of the rural poor. There should be environmentally sound social forestry programmes integrated with fodder, fruit, fibre, timber and firewood yielding trees grown in wetlands as well as in wastelands. Thus, multiple tree growing will not only provide inputs at the local level but also give shade, control erosion, deposit litter, support wildlife, generate employment and maintain ecological balance. Thus, the need to conserve our forests as well as such considerations as providing for the wood requirements of the rural poor have led to the movement called SOCIAL FORESTRY

Expansion of social forestry programme in India

Plan period	Allocation of resources in Rs. x million			
	Social forestry	Peoduction forestry	Others	Total
First (1951-56)	2	11	64	77
Second (1956-61)	20	49	143	212
Third (1961-66)	54	157	248	459
Post third (1966-69)	43	187	189	419
Fourth (1969-74)	71	373	450	894
Fifth (1974-79)	525	547	1016	2088
Annual (1979-80)	227	144	312	683
Sixth (1980-85)	3518	1003	2404	6925
Seventh (1985-90)	38000	8000	16000	62000

Trees recommended under Social Forestry Programmes

(i)	Acacia nilotica	:	Fuelwood, agricultural implements, gum, tanin and leaves for fodder.
(ii)	Acacia catechu	:	Gum, katha and dye.
(iii)	Aegle marmelos	:	Gum from stem & seeds, yield dye, fruits for medicinal purpose.
(iv)	Albizzia lebbek	:	Construction timber for beams, poles and shafts, a decorative furniture, gum and tan from bark.
(v)	Alstonia scholaris	:	Match wood, tea boxes.
(vi)	Artocarpus integrifolia	:	Building construction, boxes and cabinet and fruit edible.
(vii)	Bombax cuba	:	Match box, packing cases, water conduits, plywood, gum, gibre and kapok for stuffing.
(viii)	Butea frondosa	:	For rearing lac work, gum, tan bark, oil seed, yellow dye from flowers.
(ix)	Bauhinia purpurea	:	Agricultural implements, construction gum, tan bark and fibre.
(x)	Bauhinia variegate	:	Agricultural implements, gum, oil seed.
(xi)	Bambusa arundinacea	:	Pulp, agricultural implements, house construction, basket.
(xii)	Cassia fistula	:	Tan bark, posts, fruits and seed for medicinal purpose.
(xiii)	Cassia siamea	:	Wood for maltets and agricultural implements.
(xiv)	Toona ciliata	:	Building, bridge construction, toys, tea boxes, decorative plywood.
(xv)	Casuarina equisetifolia	:	Fuel, pulp for paper industry.
(xvi)	Dalbergia sissoo	:	Wood for building construction, furniture, toy & tool and brush handles, wood oil for skin disease treatment.
(xvii)	Diaspyros melanoxylon	:	Tendu leaves, tool handle .
(xviii)	Dendrocalamus strictus	:	Pulp, funiture & basket.
(xix)	Syzygium cumini	:	Construction, timber boats, tan, bark, edible fruits.
(xx)	Eucalyptus citriodora	:	Pulp, poles, essential oil from leaves.
(xxi)	Grewia eptiva	:	Fodder, fuel.
(xxii)	Leucaena leucocephala	:	Fuel, fodder, pulp and poles.
(xxiii)	Lagerstrodmia parviflora	:	Building and bridge construction, boat building, tool handles.

(xxiv)	Mangifera indica	:	Tea boxes, brushbacks, packing cases, doors and window frames, edible fruit.
(xxv)	Morus alba	:	Hockey sticks, poles, cricket stumps, tennis & badminton racket, furniture for rearing silk worms.
(xxvi)	Azadirachta indica	:	Building construction, handles, toys, agricultural implements, oil from seeds.
(xxvii)	Michelia champaca	:	Plywood, boat building, furniture, oil seeds, dye from flowers.
(xxviii)	Emblica afficinalis	:	Furniture, agriculture implements, edible fruits, richin Vitamin-C .
(xxx)	Pinus roxburghii	:	Furniture, poles, resin and pulp.
(xxxi)	Populus deltoides & other species	:	Match wood, packing cases, pulp, fuel.
(xxxii)	Pongamia glabra	:	oil seed, gum.
(xxxiii)	Santalum album	:	Wood cuts, sandal wood oil, oil seed.
(xxxiv)	Shorea robusta	:	Timber for house building, ship, railway sleepers, wood durable under water & Proof against white auts.
(xxxv)	Shoratalura	:	Lac host tree.
(xxxvi)	Sesbania grandiflora	:	Flowers edible, leaves as fodder.
(xxxvii)	Salix tetrasperma	:	Tool handles, pencile, tan bask, basket.
(xxxviii)	Tamarindus indica	:	Wood for wheels, dye & leaves, oil seed, edible fruits.
(xxxix)	Terminalia species	:	Wood for agricultured implements, house building gum dye and tan stuff & oil seed.
(XL)	Thespesia psulnea	:	Agricultural implements, oil seed and dye.
(XLi)	Tectona grandis	:	Timber for furniture, ship buildings.
(XLii)	Vateria indica	:	Packing cases, tea boxes, coffins, resins, & oil seed.
(XLiii)	Zizyphus mauritiana	:	Agricultural implements, edible fruit, dye & tan stuff from bark.

Value-added farm forestry should be advocated by the social forestry of the Forest Department for establishment of multi-layer polyculture of tree and ground flora (agroestry systems) on the same site. This would ensure immediate return to the farmer, optimum utilization of the nutrient and moisture attributes to the soil and atmosphere and better soil and water conservation.

Employment Generation

Social forestry programme which involves a number of activities for example, nursery development, pit/trench digging, planting, maintenance and after care, harvesting,

transportation, handling and processing, all are labour intensive and employment generating. It has been estimated that planting on 1 ha. of land generates about 300 mandays.

The main limiting factor operating poverty in the rural sector is the lack of processing/conversion facilities. Most of the harvest is sold in the raw form in the urban centres, thus, resulting in low return to the producer and dividends to the middleman. Untill and unless the raw produce is processed in the form of value added products, income of the beneficieries cannot be raised. There are a number of industries based on biomass like rice milling, dal-milling, oil extraction which can use the residues as a source of energy. Establishment of a chain of biomass-based industries will generate employment both for the skilled and non-skilled and thus, prevent outflow of income from village to cities. Large scale rural industrialisation is very essential for poverty alleviation programme.

Manpower-Training/Educational Re-orientation

Education has so far remained 'indoor, bookish based on cramming/rote memory'. There is hardly any scope for thinking or innovation. It is why it has become as much a commercial activity as any other profession. The answer lies only in 'reorientation'. It has to be open, natural, and outdoor. Social forestry conversion technologies and end-use applications. Preparation of a module socially acceptable, environmentally compatible, economically sound and technologically mature, is a pre-requisite for the success of this programme. Proper understanding of the organic linkages between biomass energy and education can go a long way to meet the national priorities.

Conclusion

In conclusion, it may be stated that social-forestry does not imply merely planting of trees and crops together but it is something more. It has both vertical and horizontal dimentions. Vertically it means maximising output and income through optimisation of the bio-features of the rest materials and inputs. Horizontally this concept is associated with national priorities, such as , wasteland utilisation, food, fodder and fuelwood production, employment generation, environmental protection, educational re-orientation, income generation, rural industrialisation and finally life style of the people.

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LOW COST WET GRINDER FOR SOYBEAN

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In this paper the authors discribed about Wet Grinder which they have developed in the Institute. The author has discussed about the performance of wet grinder and discussed about the economics of operation and applications of wet grinder.

Introduction

Soyabean contains 40% quality protein and 20% oil. It can be a solution to protein calorie malnutrition existing in rural areas. Presently major portion of this crop goes for oil extraction and deoiled cake is either used as cattle feed or exported. The reason for its limited or negligible use for food purposes is lack of simple processing technologies and equipment to process soybean into various food products. Wet grinding of soybean is one of the important operation which prepares the material for production of soymilk, soyicecream soypaneer and soybean badi (similar to badies from other pulses).

The various types of mills, grinders and disintegrators used to grind soaked soybeans in the production of soypaste are of two basic type, i) those grind with stone or composite mill stone and ii) those that grind with steel hammers, pins or blades (Shurtleff et. al, 1984). The latter type are expensive but more popular since they are more sanitary and easier to clean, work better with hot water grind, require less maintenance and repair.

Keeping in view the above points a low cost plate grinder has been developed and its performance details are given in this paper.

Wet Grinder

The machine as shown in Fig. 1 consists of feed hooper, barrel housing screw to convey wet material, grinding plates, clearance adjustment and a support frame. The detail specifications of the machine are given in Table 1 , the bill of material for its fabrication are given in Table 2. The feed hopper is made of 20 gauge MS sheet with a sliding plate to control the feed rate. The barrel contains single flighted screw with 2 mm clearance all along the priphery . The wet soybean from hopper is convenyed to plates by this screw. The grinding plates are made of 15 mm MS plate of 150 mm diameter. The serrations are made at 10^{o} interval and the plates are coated with nickel coating. One plate is stationary and fixed on the flange of the barrel containing screw. The opening equal to barrel diameter is provided at the centre of the plate to receive wet material. The rotating plate is fixed on the extended

shaft of the screw. At the centre of the fixed plate a small cavity 7.5 cm dia is provided to collect the wet material before it is pushed to edges by centrifugal force. The clearance between the plates can be controlled by a cup and screw mechanism provided on the casing. The position of the rotating plate can be fixed by rotation cup which slides the central shaft. A guided outlet is provided below the plates on the casing for collecting ground material. The barrel supports the hopper screw and also casing containing plates. The barrel is mounted on the MS angle frame. The unit is operated by 1 hp. AC motor, with pulley belt drive.

Performance

The wet soybean after 4 hour soaking had moisture content of 61.8% . Time required for grinding per batch of 3 kg was 7 min and per hour capacity was 25.71 kg of soaked soybean (Table 3). The power required was 550 watts while grinding and at no load power required was 420 watts.

The specific power requirement was only 21.39 watts/kg of wet soybean inclusive of power required to run the machine at no load. The average (minimum) quantity of water required was 620 ml per kilogram of wet material. However, large amount of water can be added while grinding for the purpose of tofu. The material passing through IS 100, IS 85, IS 60 and IS 40 was 90.28%, 87.53%, 82.27% and 77.43% respectively. The graph showing the parcticle size distribution of slurry is given in Fig. 3. The graph was plotted for cumulative quantity passing through sieves of 1, 0.594, 0.592 and 0.420 mm. The graph is straight line relationship between the screen size of 1 mm and 0.42 mm. The coefficient of determination was r = 0.9211. F test conducted on the data showed that result is highly significant between screen sizes of 0.42 and 1 mm. The fineness of the material can further be increased by grinding the material in double pass. The clearance while grinding was kept at 1 mm. The grinder requires only about 1 m^2 area for housing and does not require any foundation.

Economics of Operation

The economic of the grinding machine on the basis of 200 days of operation per year and 8 h operation per day is as given in Table 4. One skilled labour is required to operate the grinder. The fixed cost including depreciation, housing, maintenance and repairs and insurance comes to about Rs. 975/- per year, Rs. 4.00 per day and Rs 0.50 per hour. The variable cost which includes labour and power comes to Rs. 20.00 per day and and Rs. 2.5 per hour. The operating cost thus comes to Rs. 24.00 per day and Rs. 3.00 per hour. Since the overall capacity of the grinder is 25 kg material per hour the cost of grinding comes to Rs.0.15 per kg of wet material. On the basis of raw soybean the cost works out as Re. 0.32 per kg.

Application and use of Wet Grinder

Slurry obtained by wet grinding of soybean can be used for making soymilk which could be further processed for soybean curd, soybean paneer. Soybean badi can also be prepared from the ground paste after mixing with other pulses. The paste can also be used for making variety of traditionally popular snacks.

Soybean badi can be made from wet grinding of soybean. It is a simple process where soydal soaked in 1% $NaHCO_3$ solution is ground with wet grinding machine. After adding salt and other spices into it, material is cooked for 30 min and formed in the shape of badies. This product, which is made from 100% soybean contains 43% protein, 19% oil and only 0.22 units of urease activity. The soybean badi made with this simple method and using wet grinder were found acceptable by adding into starchy vegtables like badies from other pulses.

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Table 1 : Specification of Wet Grinder

Type	: Plate type, axial feeding
Overall dimensions	
Length, mm	: 1000
Width, mm	: 620
Height, mm	: 880
Diameter of plates, mm	: 150
Length of feeding screw, mm	: 330
Speed of the plates, rpm at no load	: 2400
Capacity, kg/hr of wet dal	: 25
Consumption, power w/hr	: 550
Approximate cost of the grinder	: Rs. 3000.00
Cost of unit operation	: Re. 0.15/kg of wet material

Table 2 : Bill of material for fabrication of wet grinder

Sl. No.	Component	Material	Ouantity	Approx. Rate in Rs.	Amount in Rs.
1.	Hopper	18 gauge MS sheet	0.1904 m^2	12/kg	30.00
2.	Barrel	MS Pipe 90 mm ø	30 cm	12/st	25.00
3.	Shaft	MS rod ø 25 mm x 80 cm	3.0816 kg	7/kg	25.00
4.	Screwfights	MS sheet 18 gauge	0.0032 m^2	12/kg	5.00
5.	Grinding plates	15 cm dia & 8 mm thick MS plates	0.0353 m^2	11/kg	30.00
6.	Casing	MS sheet	0.6443 m^2		80.00
7.	Clearnace mechanism	MS pipe ø 60 mm ø	61 cm	12/ft	10.00
8.	Bearings	25 mm ø ø	2 nos	50/each	100.00
9.	Bearing housing	25 mm ø	2 nos	25/each	50.00
10.	Frame	MS Angle MS flats	12.912 kg	7/kg	100.00
11.	Pulleys & belt	100 mm 64 mm V belt	1 no 1 no 1 no	--	100.00
12.	Painting etc.	--	--	--	45.00
	Total	--	--	--	600.00
	Fabrication charges	--	--	--	400.00
	Cost of 3 phase Acelectric motor	--	--	--	1800.00
		Total	--	--	2800.00

1. HOPPER
2. BARREL
3. SCREW
4. CASING
5. CLEARANCE MECHANISM
6. OUT LET
7. GRINDING PLATES
8. FRAME
9. ELE. MOTOR
10. V-BELT

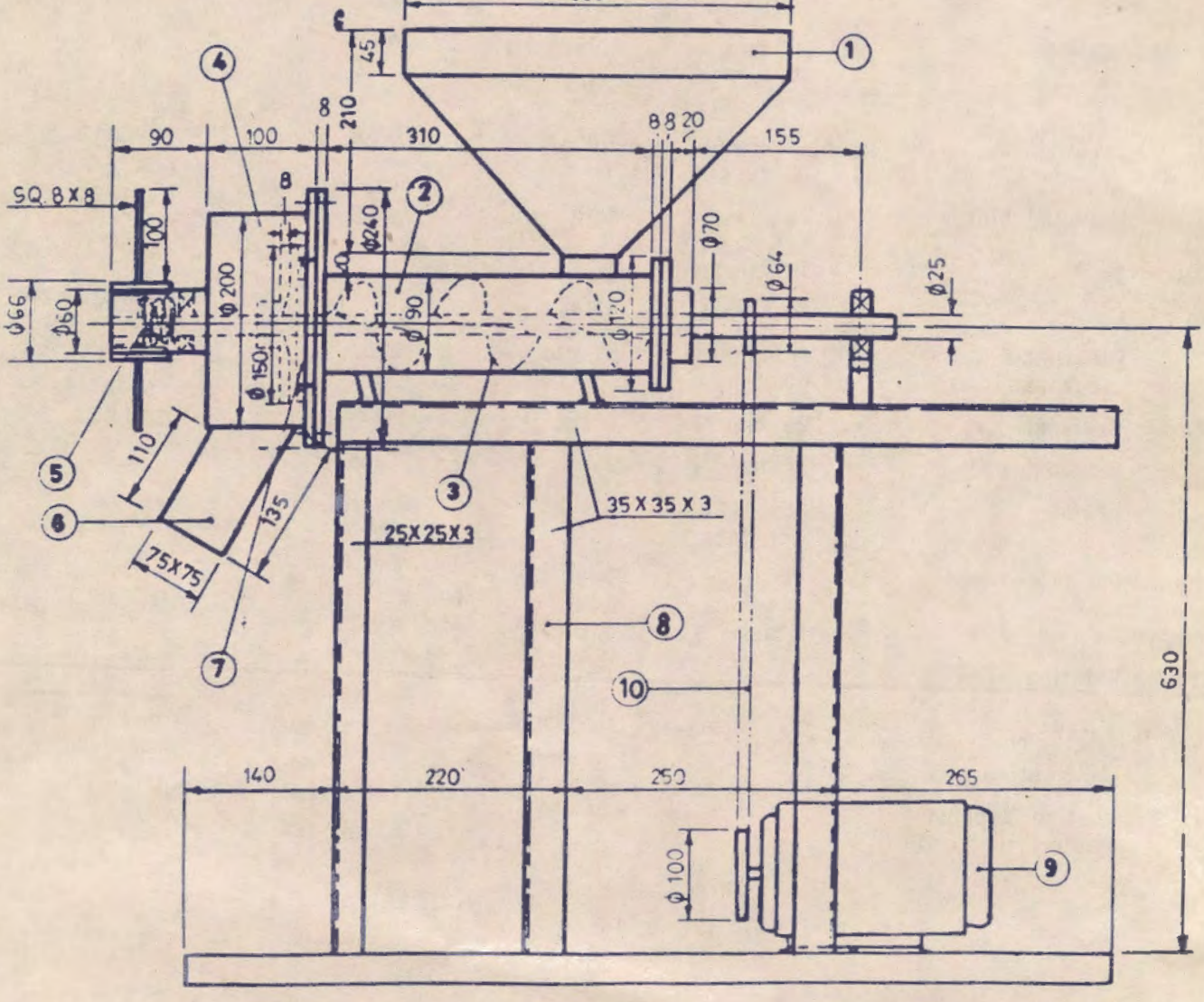

FIG. 1 : WET GRINDER FOR SOYBEAN

Table 3 : Testing results of the wet grinder for soybean

Particular	Average value*	
Mositure content of soaked beans	61.8 %	wb
Ouantity of soaked beans/batch	3	kg
Time required for grinding	7	min
Power required for grinding	550	watts
Power at no load	420	watts
Water required for grinding	620	m1/kg
Material retained on (graphical representation see Fig 3)		
(i) IS 100 sieve	9.76 %	
(ii) IS 85 sieve	12.47 %	
(iii) IS 60 sieve	17.73 %	
(iv) IS 40 sieve	22.57 %	
Speed of the plate	2400 rpm.	

* These values are an average of 5 replications.

Table 4 : Economics of the plate type wet grinder

(i)	Cost of the machine	:	Rs. 3000.00
(ii)	Capacity of the machine	:	20 kg of soaked soybean/hr
(iii)	Operation in days per year	:	20 days
(iv)	Operation in hour per day	:	8 h
(v)	Labour cost (skilled)	:	Rs. 16/day
(vi)	Life of the machine	:	10 years
(vii)	Salvage value	:	Rs. 3000.00
(viii)	Rate of interest	:	18 %

Fixed cost (A)

(a)	Depreciation	:	$\frac{3000-300}{10} = 270.00$
(b)	Housing 10% of initial cost	:	Rs. 300.00
(c)	Maintenance and repairing 5% of initial cost	:	Rs. 150.00
(d)	Insurance 2.5 %	:	Rs. 75.00
	Fixed cost/year	:	Rs. 795.00
	Fixed cost/day	:	Rs. 3.975
	Fixed cost/hour	:	Re. 0.50

Variable cost (B)

(a)	Labour charges per day	:	Rs. 16.00
(b)	Electricity Re. 0.50/unit	:	Rs. 4.00
	Variable cost/day	:	Rs. 20.00
	Variable cost/hr	:	Rs. 2.50

Cost of operation (A+B)

	Operating cost/day	:	Rs. 24.00
	Operating cost/hour	:	Rs. 3.00
	Operating cost/kg of ground material	:	Re. 0.15

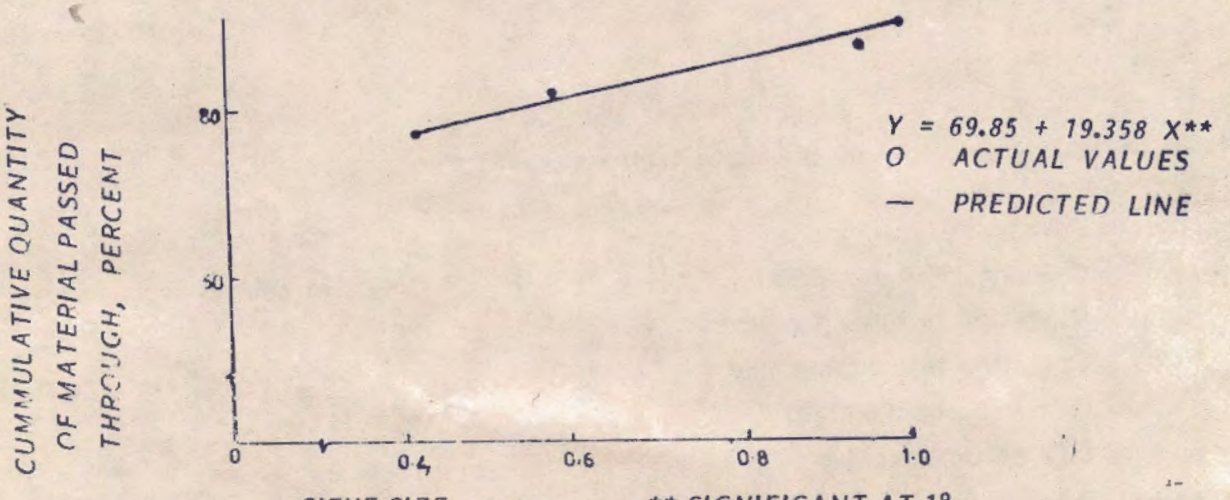

FIG. 2 PARTICLE SIZE DISTRICUTION OF GROUND BY WET GRINDER

PREVENTION OF ENVIRONMENT THROUGH LOW COST SANITATION

Dr. Bindeshwar Pathak

Founder & Chief Patron Sulabh International

The various aspects of environmental pollution caused due to transportation of human excreta has been discussed in this paper. The author has suggested about low cost on site disposal system and water seal flush latrine as a solution in the pollution problem.

The fast deterioration of environmental and ecological balance in India has become a matter of deep concern. Population explosion, urbanisation, industrialisation, felling of trees, erosion of soil and an ever increasing number of vehicles and factories are the main causes of this imbalance.

But over and above all these, another major cause of imbalance which is particular to this country is the centuries old sub-human and unhealthy traditional practice of open air defecation and the use of bucket or dry latrines cleansed manually which have become a matter of deep concern. The excreta from the bucket privies often spilled in the vicinity during its transport to the disposal site. Due to cleaning of the privy chambers by pouring water through the squatting holes, excreta flows into drains running along the houses exposing the entire locality to health hazards and foul environment

Human excreta is the cause of many enteric diseases such as cholera, dysentery, typhoid, parathyphoid, infectious hepatitis, hookworm etc. Over 50 infections can be transferred from a diseased person to a healthy one by various direct or indirect routes from excreta. Therefore safe disposal of human excreta should be the primary objective of improved sanitation to build a healthier nation and provide a cleaner environment.

The major cause of the high rate of incidence of these diseases in India is the tradition of open air defecation by millions of people every morning and evening, and the existence of hundreds and thousands of dry/bucket latrines in towns and metropolitan cities. It is a common sight in our country to see the excreta flowing through open drains due to defecation by children as well as many a time by adults and also due to the system of cleaning bucket privies by scavengers who discharge the human excreta into the drains which flow infront of the houses.

What a painful paradox persists. On one hand a gigantic leap in the field of Science and Technology is ready to take us into the 21st Century, while on the other the centuries old practice of manually cleaning and carrying night-soil on the head by scavengers remains a blot on our civilisation.

The employment of human beings of a particular class called "scavengers", who make house-to-house collection of human

excreta in buckets and baskets, and carry them on the head, shoulders or hand for disposal is perhaps to-day the greatest stigma in our Indian society. The greatest weakness in the svavenging system is the for such a demeaning task which is looked down even by those who derive the denefit of their services. The stigma attached to this profession has passed down from generation to generation and the scavengers continue to carry out this work unwillingly. Thus the conservancy system is being handled by the unhappy, grudging and sullen labour. Many of the scavengers have lost their sensitiveness of human and social values of life having been obliged to take up such profession since their childhood. This appears to have affected the mental attitude of the scavengers at work or at home who are segregated from the rest of the community. There are hardly few countries in the world where scavenging is still prevalent. Scavenger population in India is disproportionately very high, signifying the preponderance of bucket/dry latrines in the country.

Since pre-independence period, the nation has been talking about their plight and has from time to time sought for the removal of this demeaning practice of manual handling of night-soil, but somewhat in a half hearted manner, with the result that the achievement in this regard has been insignificant.

It is amazing to note that out of 800 million people, more than 700 million of this country either defecate in the open or use bucket privies.

Since nineteen forties sanitary engineers, experts and scientists in India started searching for an affordable, acceptable and easily available alternative solution to prevent open air defecation in the rural areas of India. The pour flush water-seal latrine with on-site disposal of human waste which seems to be feasible in most of the situations, and could satisfy the above criteria was initially developed by the All India Institute of Hygiene and Public Health, Calcutta. Further refinements were brought about subsequently by various research and other organisations, both governmental and non-governmental. The few projects taken up were primarily research oriented to find out least cost solution to the problem and were supported by other activities such as health education and communication support.

Low cost on-site disposal of excreta with pour-flush waterseal latrine (LCS) was introduced in India in the late fiftees as a national programme in the rural areas, although it did not succeed due to various constraints. In the late sixties a few small towns which were more rural in character, had been provided with LCS in the states of Tamil Nadu and Gujarat in a very limited way. No thought was given to develop this system as a solution to stop open air defecation and for replacement of bucket privies.

I pondered over this situation and founded an Organisation called Sulabh Shauchalaya Sansthan in 1970 (now Sulabh International) and started advocating the adoption of the same two pit pour-flush water-seal latrine, popularly known as Sulabh Shauchalaya, with some modification of what was developed in the nineteen sixties to replace the bucket latrines and stop open air defecation in thickly populated urban areas. In the beginning the Public Health Engineers were very much opposed to the idea and I had to face stiff resistance. But gradually I was able to persuade the Government of Bihar to adopt this technology in urban areas. Sulabh International was able to introduce LCS in several towns including class I towns (population above 100,000) and even in Patna, the capital city with a population above 0.5 million.

In 1974, Sulabh International introduced the system of operating and maintaining 'pay & use' community toilet complexes round the clock with people's participation without any burden on public exchequer or to the local authorities. These Sulabh Complexes offer further amenities like bathing and washing facilities and urinals. Now it is proposed to provide some other facilities like public telephone primary health care unit ambulance van and creche for children etc.

Observing the success of the LCS programme of Sulabh International, the

Government of India in collaboration with WHO and UNICEF and participation of Sulabh International organised the first National Conference in Patna in 1978, which was attended by public health engineers, public health scientists, planners, administrators and sociologists of the Central and State Government . All the participants, after seeing the work done by Sulabh International in Bihar, were convinced that LCS technology adopted there is the only affordable option for improving the environment by converting the bucket privy and providing a toilet in every home, Sewerage and septic thanks are not the answer with the present economic conditions as the cost is prohibitive both for construction, operation and maintenance . Neither the government nor the community could afford them.

The Government of India convinced by the unanimous support for LCS in this country requested the UNDP in 1979 with the World Bank as the executing agency to prepare feasibility reports in urban areas. In three phases, feasibility reports for 211 towns in 21 states and 6000 villages were prepared . In these reports it was concluded that pour-flush water-soal latrine with twin teach pits is the most suitable technology for adoption in India. Thus it was the pioneering and successful achievement of Sulabh International in the urban areas in the field of LCS that paved the way for providing a better environment for improving the nation's health and hygienic conditions in the country.

Environment influences the thoughts and habits of human beings. Their social and cultural development would respond with better community health and personal hygiene amidst environmental betterment. Sulabh International's goal is to remove such environmental deterrents by replacing the bucket privies in individual homes with LCS and provide community toliets with bathing facilities wherever needed to prevent indiscriminate open air defecation and improve the health and hygiene of the economically weaker section of the population.

While the provision of LCS in individual homes for replacing the obnoxious smelling bucket privies has made the residents life in a healtheir environment, the toilet complexes with bathing facilities, in addition to the improvement of environment have restored human dignity by providing facilities for defecation and bathing in privacy to those who were deprived of these. With eradication of scavenging, scavengers have also been relieved from the demeaning task of manual handling of excreta.

LCS is one of the components of India's prestigious project "Prevention of Pollution of River Ganga" of the Government of India to improve the environment.

It was realised that the relieving the scavengers from their demeaning task of manual handling of human excreta was not the end of the problem. There was need for rehabilitating them in some socially acceptable profession. Most of the scavengers lose their sensitivity to the dignity and social values of life. Thus there is a need for a change in their social life and mental attitudes to improve the environment of the community. Sulabh International has therefore established a model Institute for training the scavengers, their wards and other dependents for different vocational training such as for electrical , mechanical, TV mechanics, motor vehicle drivers, pump attendants, and for typing, basket making and many other arts and crafts which would enable them to live in society with dignity and class distinction will vanish. The organisation is helping the state governments in preparing projects for establishing such Institutes.

PROMISING ROOFING TECHNOLOGY FOR RURAL POORS OF THE COASTAL REGION OF THE INDIA: Treated thatches

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The paper deals with different types of roofing material which are useful to poor people and applied in rural areas of Coastal region. The author has discussed about various chemical treatments of thatches which enhances the life of thatches.

Introduction

The housing problem in developing countries is becoming increasingly important due to an expanding population, rapid industrial development and growth of towns. The prices of the building materials are trying to touch the maximum and becoming out of the reach of a middle income group families. The poors lived in villages, depending upon the bread spared by the village authorities, passing their days very hard. They can't think for 'a pucca construction' for their homes, as these are not within their reach. Normally, they need 'only' a low cost roof on their head. The presentation tries to present a process developed by a research institution, need urgent attention of the respective State Governments so that material used annually, by the poors could be utilised in the most effective manner. The coconut leaves are being widely used in the coastal regions of India for roofing of a poor man.

By the developed process, the life-span of the thatch proved to be increased by four times.

Thatch

Thatch is a roof covering made of dead plant material other than wood. Grass , coconut and palm leaves are the most widely used materials ; many others, such as seaweed, herbaceous fibres and large leaves provide roofing material for traditional building.

There exits number of shortcomings having the traditional method of thatches, for example, they leak, a tendency to harbour insects and other pests, tends to catch fire, less durability etc. On the other hand, traditional thatching for a poor persons, the durability is the low priority component but tends to attract other factors like low cost, simplicity, availability, convenience in thatching, does not need sophisticated machinery or tools. Also, one may say that scientifically and classically, thatching is creative and satisfying work. It is a craft, it is a very versatile roofing material, keep a house cool in summer and warm in winter, provides excellent insulation against extremes of temperature, provides sound insulation and requires simple and inexpensive maintenance.

Life & Potential of the thatch

Table 1 shows the life-span of the various thatching materials

Table 1

Thatching Material	Country	Life Span
1. Coconut leaves	India, Ceylon Polynesian Islands	1-2 years (less than 1 year in Kerala)
2. Palmyrah leaves	India, Ceylon, Burma	2-3 years
3. Nippa Palm leaves	Malaya, Sumatra, India (Bengal) Ceylon, Phillippines, Australia	10 years
4. Thatch grade grasses, Teeds (laid 15" thick)	South Africa, Fiji, Phillippines	15 years (25-30 years if properly laid)
5. Corpha Umbraculifera	India	2 years
6. Arenga Pinnata (sugar palm leaves)	Phillippines, parts of Malaya	Thatch made from fibres obtained from the leaf sheets, last for 30-100 years.
7. L. Jenkinsiane leaves	Sikkim, Assam (India)	Not available

Table 2 shows the area under cultivation in States/UT's of the Country.

Table 2 : Area under Plantation of Coconuts (1986 - 87)

States/U.T's	Area in hactares
Andhra Pradesh	48,100
Assam	8,000
Karnataka	2,07,700
Kerala	6,83,800
Maharastra	7,000
Meghalaya	—
Orissa	27,600
Tamilnadu	1,71,900
Tripura	2,700
West Bengal	17,000
A & N Islands	28,700
Goa, Damen & Diu	22,900
Lakshadeep	2,800
Mizhoram	—
Pondicherry	1,600
All India (1986-87)	12,29,800

The Table No. 2 provides us the feed back on the potential of applicability of coconut leaves as the great capturable resource as the roofing for the rural masses in India.

Traditional method of thatching

Thatching is generally carried out before the onset of the south-western monsoon. It involves the following steps :

1. Cutting and seasoning
2. Spliting and sorting
3. Retting and plaiting
4. Thatching

Ripe coconut leaves are cut during the period February-May and seasoned by putting under the sun for a few days. When the colour of the leaves turned from green to pale brown, the leaves are sorted out and split longitudinally after cutting off both the ends. The split leaves are then tied into bundles of about one feet diameter and immersed in

water (retted) for a day or two. After retting, the leaves are plaited to obtain thatch sheets.

Development

In 1981, Regional Research Laboratory (RRL), Trivandrum has developed a simple chemical technique through which life of the thatches could be extended from 1 to 4 years. The chemicals required for treating the thatches are Copper Sulphate ($CuSO_4$), Cashew Nut Sheet Liquid (CNSL) and Kerosene, Ordinary power sprayer used for agricultural purposes or brushes, in case, pump is not available and a tank in which coconut leaves could be dipped in Copper Suphate solution.

Process

The copper sulphate solution of one percent concentration (1 kg $CuSO_4$ in 100 litre of water) is prepared and 20/30 plaited thatches by turn can be dipped for 5 minutes each and then taken out, after draining the excess copper sulphate solution into the tank. Such treated thatches with $CuSO_4$ solution has to stack in 250/300 sheets bundle for one complete day and then allowed to dry under shade.

The dried thatches for spraying treatment has to placed in an open courtyard and sprayed with the help of pump having the diluted CNSL 10 litres of CNCL diluted with 1 lt. of Kerosene). Both the faces of thatches has to be sprayed. The sprayed thatches with CNSL solution then has to placed in the sunlight till totally dries.

The treated thatches thus now are ready for roofing. The upper portion of the leaf being exposed instead of the lower portion as in traditional thatching. The strings for tieing up the thatches itself, has to be treated with $CuSO_4$ solution only.

Costs

Cost analysis for treating the thatches is highly interesting and encouraging. Taken into consideration of latest prices of $CuSO_4$, Kerosene and CNSL, below are the estimates for 200 sheets.

The cost of labour and thatches has not been included considering that the beneficiaries atleast should have to contribute for his benefits. Illustratively, the labour charges for treating 200 sheets would be Rs. 25 and cost of 200 sheets be Rs. 100/-. So, in other words if we include the above, the cost of 200 treated thatches would be Rs. 229/-. Table 3 indicates the benefits to the rural poor who has to replace the untreated thatch every years.

S.N.	Material	Oty.	Rate in (Rs.)	Rate in (Rs.)
1.	Copper/ Sulphate	1 kg	30/kg	30.00
2.	CNSL	10 lt.	7/lt.	70.00
3.	Kerosene	1 lt	4/lt.	4.00
			Total :	104.00

*It does not include the cost of thatching in both cases.

In case, every person has to replace every year it would cost him Rs.400 (Rs. 100x4) including his labour every time while Rs. 229/- works for 4 consecutive year saving the time, materials and management. Of course, an additional requirement for the treatment certainly need a tank, pump and a courtyard to work in. The expenditure on tank and pump would be the permanent assets.

A list of the manufactures/exporters of Cashew Nut Shell Liquid (CNSL)is at Annex-I where one could received. The CNSL of the approved quality as all the manufactures listed bove, are the members of the Cashew Export Promotion Cochin, Kerala.

Dissemination

CAPART supported three projects one each in Kerala, Tamil Nadu and Andhra Pradesh to demonstrate and transfer the technique and see the response of the community, users and the Government departments. So far, users response is highly encouraging while Governments departments response is till not seems to be encouraging even after lot of efforts for pusuing the technology.

TABLE - 3 : Comparision of benefits between treated and untreated thatches.

S.No.	Product	Cost*	Life	Ouality
1.	200 treated sheets	Rs. 204	4 years	satisfactory
2.	200 untreated sheets	Rs. 100	1 year	Not satisfactory

Recommendation & Action

I would like to mention and emphasise the need for formulating a kind of delivery system through which the poors having a coconut thatch roofing should not have to repeat/think for its replacement annually, and also the retained leaves can be effectively utilised elsewhere.

Annex-II provides a statistics which leads to emphasise that for a well tested process having the potential resources rightly available in their districts/States require an 'attention and encouragement' of the State Government. 'An encouragement' if attended, may leads to a big successful programme of the Government which can be linked with the Central Government programmes like NREP, IRDP, DWCRA and Jawahar Rojgar Yojna (JRY). District Magistrates may even take a fresh initiative to disseminate the technology for the benefits of the poors.

Annex-III indicates the resources where one could get the technical details of the technology for the purpose of dissemination transfer in rural areas.

This papers also request the attention of the planners to the governmental/non-governmental programmes, to provide 'A Durable Roof' of atleast the poors of the coastal region.

Annexure - 1

List of Manufacturers/Exporterers of CNCL Approved by cashew Export Promotion Council, Cochin, Kerala.

Sl.No.	Name & Address
1.	M/S. Achal Industries, Chamber Buildings, Bunder, Mangalore-1
2.	M/S. Asiatic Export Enterprises, Kilikolloor, Ouilon-691 004.
3.	M/S. Binod Cashew Corpn., P.B.No. 110, Ouilon-691 001.
4.	M/S. Bola Raghavendra Kamath & Sons, Kukkundur-576 117, Karkala, S.Kanara
5.	M/S. Indian Nut Production P.B. No. 53, Ouilon-691 001
6.	M/S. Indian Resins and Polymers, P.B. No. 162, Ouilon-691 010.
7.	M/S.Janso Exports P. Ltd., N.N.C Estate, Vadakkevila P.O. Ouilon-691 010.
8.	M/S. Kerala Nut Food Co. P.B. No. 80, Ouilon-691 001.
9.	M/S. K.Gopinathan Nair & Co., P.B.No. 101, Ouilon-691 0001.
10.	M/S. K.Subraya Anantha Kamath & Sons, Cashew Exporters, Adkathbail, Kasaragod-670 121.

11. M/S. K. Subraya Anantha Kamath & Sons, Cashew Exporters, Vinobhanagar, Jalcoor, South Kanara - 574 255.
12. M/S. K. Vishwanath Subraya Kammath & Sons, Rama Sakthi Mission Road, Padavu, Mangalore - 575 005.
13. M/S. Lakshman & Co. Kilikolloor, Ouilon-691 004
14. M/S. Mizar Govinda Annappa Pai & Sons, P.B. No. 108, Magalore-575 001.
15. M/S. Nayak Trading Company, P.B.No. 324, Ouilon-691 001.
16. M/S. Peirce Leslic India Ltd. Bristow Road, Cochin-682 003.
17. M/S. Pratap Cashew Co. (P) Ltd. P.B. No. 115, Ouilon
18. The Kerala State Cashew Development Corporation Ltd. P.B. No. 13, Ouilon - 691 001.
19. M/S. Unni Enterprises, P.B. No. 80, Ouilon - 691 001.
20. M/S. Urban Stanislaus & Co., P.B. No. 12, Ouilon - 691 001.
21. M/S. Vijayalaxmi Cashew Co., P.B. No. 115, Ouilon - 691 001.
22. M/S. Younus Cashew Industries Vadakkevila , P.O., Ouilon - 691 010.

Annex - II

Districtwise area under Plantation of Coconut in India (1985 - 86)

State/Dist.	Area (hectr)	Dist.	Area (hectr)
Andhra Pradesh			
1. Srikakulam	7,700	12. Vizianagaram	800
2. Visakhapatanam	2,900	13. East Godavari	16,800
3. West Godavari	6,100	14. Krishna	500
4. Guntur	100	15. Prakasam	100
5. Nellore	100	16. Kurnool	100
6. Anantapur	300	17. Cudapah	200
7. Chittoor	1,600	18. Rangareddy	100
8. Hyderabad	--	19. Nizamabad	--
9. Medak	--	20. Mahaboolnagar	--
10. Nalgoda	--	21. Khammam	--
11. Karimnagar	--	22. Warangal	--
Total -	47,400		

Assam

1.	Cachar	1100	10.	Karimganj	135
2.	Goalpura	1000	11.	Dhubri	426
3.	Kokrajhar	125	12.	Kamrup	2,674
4.	Barpeta	450	13.	Darrang	611
5.	Santipur	468	14.	Nowgang	2,316
6.	Jorhat	420	15.	Sibsagar	100
7.	Lakhimpur	110	16.	Karbi-Anglong	136
8.	N.C. Hills	4	17.	Dibrugarh	88
9.	Pragjyotispur	2	18.	Nalbari	1,650

Total - **8,034**

Karnataka

1.	Bangalore	9,311	11.	Belgham	81
2.	Bellary	888	12.	Bidar	2
3.	Bijapur	160	13.	Chikmangalur	23,839
4.	Chitradurga	26,699	14.	Dakshin Kannada	18,010
5.	Dharwad	670	15.	Gulbarga	29
6.	Hassan	38,355	16.	Kodagu	587
7.	Kolar	1,449	17.	Mandya	11,241
8.	Mysore	11,455	18.	Raichur	337
9.	Shimoga	4,011	19.	Tumkur	50,359
10.	Uttara Kannada	5,292			

Total - **2,02,775**

Maharashtra

1.	Thane	100	3.	Raigad	800
2.	Ratangiri	600	4.	Sindhadurg	5,500

Total - **7,000**

Kerala

1.	Trivandrum	76.969	8.	Ouilon	68,927
2.	Allepy	45,699	9.	Kottayam	48,179
3.	Idukki	15,036	10.	Ernakulam	55,678
4.	Trichur	62,438	11.	Palghat	25,504
5.	Malapuram	62,214	12.	Kozhikode	107,599
6.	Wyanad	3,251	13.	Cannanore	90,063
7.	Pathadamthitta	25,926			
	Total -	6,87,483			

Orissa

1.	Balasone	5,890	8.	Bolangir	440
2.	Cuttak	5,400	9.	Dhenkanal	408
3.	Ganjam	4,483	10.	Kalahandi	164
4.	Keonjhar	224	11.	Koraput	323
5.	Mayurbhanj	469	12.	Phulbani	293
6.	Puri	9.067	13.	Sambalpur	217
7.	Sundargarh	180			
	Total -	27,558			

Tripura 2700

Tamil Nadu

1. Chengalpatu	3,984	10. South Arcot	2,775
2. North Arcot	8,190	11. Salem	6,679
3. Dharmapuri	9,691	12. Coimbatore	27,332
4. Periyar	8,340	13. Truchirapalli	5,521
5. Pudukkottai	1,750	14. Thanjavur	24,682
6. Madurai	7,714	15. Ramanathapuram	6,164
7. Tirunelveli	11,360	16. Kanyakumari	23,638
8. Muthuramalingam	3,566	17. Kamarajar	2,441
9. Others		18. Anna	7,320
Total -	**1,67,411**		

West Bengal

1. Darjeeling	8	9. Jalpaiguri	408
2. Cooch Behar	180	10. West Dinajpur	120
3. Malda	115	11. Murshidabad	3,405
4. Nadia	282	12. 24-Pargavas (N)	3,667
5. 24-Paragavas (S)	1,130	13. Howrah	1,650
6. Hooghly	331	14. Bardwan	1,448
7. Birbhum	115	15. Bankura	20
8. Midnapur (W)	850	16. Midnapur (E)	1,596
Total -	**16,983**		

A. & N. Islands	20,800	Pondicherry	1,626
Goa, Dam. & Diu	22,925	All India	12,15,475
Lakshadweep	2,780		

Annex - III

List of Resource Institutions for Obtaining the Technical Details of Treating the Coconut leaf Thatch for longivity.

1. Director
Regional Research Laboratory (RRL)
Trivandrum-695 019
Kerala.

2. Director
Mitraniketan,
P.O. Mitraniketan
Vellanad - 695 543
Kerala.

3. Secretary,
Vivekananda Kendra,
Vivekanandapuram,
Kanyakumari - 629 702
Tamil Nadu.

4. Director
Asian Academy
Orts. No : 1-8-429,
Chikkadapally,
Hyderabad - 500 020
Andhra Pradesh.

5. Director General
CAPART,
Guru Nanak Foundation Building
New Mehrauli Road,
New Delhi - 110 067.

Man is a tool-using animal,.... Without tools he is nothing, with tools he is all.

- Thomas Carlyle

THE DOUBLE – WALLED POT 'JALTRIPTI'

About two-thirds of our country is affected with aridity. Most of the arid and semi-arid areas are seriously lacking in adequate tree plantations due to deep percolation are very high. The first year of the establishment of tree plants is most crucial for their survival, particularly in relation to scarce availability of water. A new device has been developed by the Central Acid Zone Research Institute (CAZRI), Regional Station, Bikaner, which reduces thr frequency and total amount of water needed and ensures a regulated constant supply of moisture to tree plants for survival and better growth.

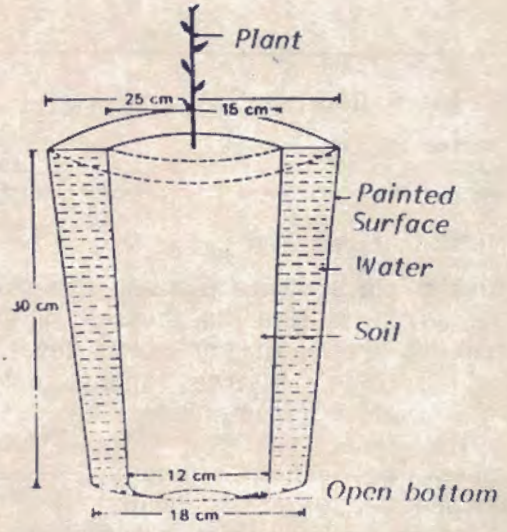
Fabrication of device

This device consists of a double-walled earthen pot named as 'Jaltripti'. The diameter of outer pot is kept approximately 25 cm at the top and 18 cm at the base. The diameter of inner pot on top and at base is kept 15 and 12 cm and the height 30 cm (since it is prepared on potter's wheel, approximate dimensions have been given, some variations in the measurements can be three). The dimesions of the inner pot have been kept slightly bigger than the size of polythene bags (25 cm long measuring 10 cm across) used for raising plants in nursury. Both the pots are joined together at the base and the basal portion of inner pot is kept almost open. The external side of the outer pot is made impervious with the help of paint, cement or coaltar.

Working Principle

i) Soil-moisture tension and plant roots create a suction force which draws moisture towards it form the neighbouring high-mositure zones.

ii) Earthen pots have many micropores in their wall which do not allow water to flow freely but allow its seepage in the direction where suction develops.



'Jaltripti' the double-walled pot, is better than the drip and sprinkler systems of irrigation. It effects an 85 per cent saving of water-use.

Table 1 : Height and diameter (cm) of ber plants as affected by different treatments

Treatments	Height			Diameter		
	Initial 28.5.87	Final 10.8.87	Increase (%)	Initial 28.5.87	Final 10.8.87	Increase (%)
Double-walled pot 'Jaltripti'	28	52	85.7	0.32	0.37	78.1
Control	28	33	17.9	0.20	0.31	55.0

Table 2 : Root length, fresh weight and dry weight of ber plants as on 28.11.87

Treatments	Root length (cm)	Fresh weight (g)	Dry weight (g)
Double-walled pot 'Jaltripti'	86.0	17.9	10.1
Control	25.0	1.5	0.8

Method of use

At the place where planting has te be done, the device is fixed in the soil such that the brim of the outer pot is in level with the field surface. A tree sapling along with soil received from nursery is transplanted in the inner pot. The water is filled in the space between two pots and the ciruclar surface of water is covered by a polythene sheet to avoid direct evaporation of water. The paint on external side of the outer pot prevents outward movement of water by seepage through the pot Be, the suction force created by the soil of inner pot allows for the seepage of water steadily in that direction and keeps the soil sufficiently moist for the growth of plants. Water is to be filled weekly or fortnightly depending upon the season and size of pot. The device has been named 'Jaltripti'.

Performance

Preliminary trials have shown very encouraging results. Two-and-a-half-month-old ber (Ziziphus nummularia) seedings were planted in May in 'Jaltripti' and under conventional method of planting in the pits. Observations on height and stem girth of plants were recorded at 10 days interval till the monsoon showers in August. The observations showed that increase in the height of plants in pot was 85.7 per cent whereas in conventional planting it was only 17.9 per cent. Similarly, the increase in diameters were 78.1 and 55 per cent under the experimental and conventional methods of planting (Table 1.).

After 6 months of planting, the data on root length, fresh weight and dry weight were also recorded (Table 2).

Only 2 litres of water is applied to a plant in each watering. A total of 17 waterings (only 34 litres water) were applied to a plant. In double-walled pot constant regulated supply of moisture is maintained. Under conventional planting, however, the moisture remains high just after watering and dries up a level it can no longer become available to plants.

Thus, the double-walled pots ensure a better establishment of the trees.

Merits of 'Jaltripti'

1. Economy of water (80-90 per cent).
2. Saves more water than drip and sprinkler systems.
3. Low irrigation frequency.
4. Labour-saving.
5. Checks percolation, seepage and evaporation.
6. Regulates supply of moisture is always available near field capacity.
7. Material indigenously available.
8. Inexpensive (Rs 5/unit).
9. Reduces wilting and transplantation shocks.
10. Survival is 100 per cent.
11. Seedling growth is faster.
12. Plants can be raised in situ thus use of undegradable material like polythene can be avoided.
13. Amount of fertilizer, insecticides, pesticides, amendment etc is reduced.
14. Helps in regulated release of fertilizers etc.
15. Wastage of fertilizers and other application is checked.
16. Weed infestation is minimized.
17. Promising in stabilization of sand dunes.
18. Soils which are excessively water logged, saline, alkaline or gravelly in top 0-30 cm can also be afforested.
19. Increase rural employment.

Contact Agency :

Regional Research Station,
Central Arid Zone Research Institute,
Bikaner,
Rajasthan - 334002.

"Nothing makes a person more productive than the last minute".

SWOSTHEE WOOD STOVE

For harassed housewives who may wake up one morning to find that they have run out of all fuel supplies, not a remote possibility during days of power breakdowns and kerosene and LPG (liquefied petrolcum gas) shortages. Indian scientists have designed a stand-by-some improved, portable, single-pan wood stoves.

A variety of wood stoves, with single, two and three pans, have been designed, built and tested already, both in India and abroad. Single-pan stoves are usually made of metal, while two-and three-pan stoves are made of mud and mortar. The latter type of stoves also need a chimney to create a draft and help eliminate smoke in the kitchen.

The ASTRA scientists have designed a new single-pan wood stove which, they claim, can achieve an efficiency of 40 to 46 per cent. They have named their new product SWOSTHEE -- single pan wood stoves of high efficiency.

The design concept of SWOSTHEE includes : a vertically arranged duct to carry hot gases and create the necessary draft, combustion chamber below, and a loading region. There is no chimney. The vertical duct carrying the combustion products provides the draft for air to be taken in the sides in the lower region of the stove. The air is drawn in along a tangential direction, providing a longer residence time inside the tank.

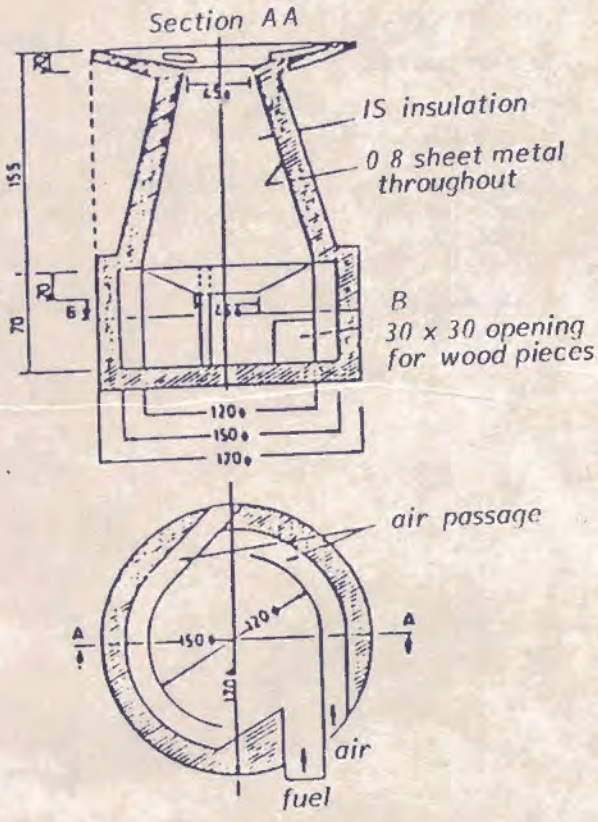
In order to ensure that the heat retained in the body of the stove is small, the entire stove is made from thin sheet metal and covered with low-density insulation of alumino silicates on the entire outer surface.

The efficiency of the stove is dependent on several factors -- period of run, moisture of wood, ambient wind conditions and vessel size.

To avoid sooting of the vessels, a flat, circular, mild steel plate of 0.8 mm thickness and another of aluminium of 1.6 mm thickness and the same diameter as the top of the stove, are introduced between the stove body and the vessel. Although this decreases the efficiency by 3 to 5 percent, the drop appears to be a reasonable sacrifice for keeping the vessel clean, the scientists say.

Emission of carbon monoxide and particulates was also found to be comparatively low and well within the safety limits.

SWOSTHEE is, to date, among the most efficient stoves available, and is able to burn even wet wood, with little accompanying smoke.



Diagrammatic representation of SWOSTHEE Model

Besides SWOSTHEE, a modified version of this stove, referred to as "modified SWOSTHEE", has also been develop. While in SWOSTHEE the emphasis is on mixing the pyrolised fuel and air well, creating a hot environment and providing enough residence time for combustion to be completed, in the modified SWOSTHEE, the emphasis is on creating a small enough combustion zone to limit the burn rate and allow the diffusion flame to dominate the combustion process. The consistently higher temperature of the diffusion flame seems to compensate for the lack of "premixedness" (of fuel and air). A perforated cylinder around the flame restricts the entry of air mostly to the fuel port and thus aids in limiting the air to fuel ratio.

Both types of stoves have been tested for water boiling efficiency and specific fuel consumption (SFC) for a specified cooking sequence. The results indicate that the modified SWOSTHEE has a specific fuel consumption value of 0.060 to 0.090 kg of wood per kg of cooked rice, as compared to other single-pan designs which have 10 to 20 percent higher values at comparable power, vessel shapes and size.

The cost of the modified SWOSTHEE is comparable to that of currently available metal stoves designs. Two areas that need further investigation are the possibility of reducing the cost by making clay stoves (pottery) and using pottery to make artistic, elegant stoves that can attract more customers.

Tobacco gives bladder cancer too!

Tobacco smoking is the most important cause of bladder cancer. In countries with a history of prolonged cigarette usage, approximately 50% of bladder cancer is men and 25% in women are attributatble to tobacco smoking. The relationship between bladder cancer and the duration and intensity of smoking are similar to those for lung cancer, although the risks are lower. The risk for the heaviest cigarette smokers is about five times that for the nonsmokers. A decreased risk approximately 15 years after smoking cessation.

LOW COST USED GUNNY BAG ROOF

Sheltering the unsheltered millions is a mind-boggling problem facing the planners, administrator and engineers. Much has been said, discussed and researched but effective solutions for ever growing massive housing needs are not in sight. Affordability is a major issue in search of viable large scale solution. The Centre for Development of Rural Technology, in the Institute of Engineering and Rural Technology, Allahabad has, in pursuit of such a solution, developed a real low cost and effective roofing system which is highly affordable as well as presents a good example in proper utilization of used gunny bags (specially cement bags).

The system and techniques

The techniques consists of making a bamboo frame-work. Bamboo of 7.5 cm diameter are used as posts or columns, top bracing, and main members of the roofing structure as shown in the drawing. However, depending upon avilability, cost etc. non-pressure Asbestos Cement Pipes can be alternatively used for columns (it gives much better finish and appearance and can be decoratively painted for even better aesthetics).

Bamboo, if used as column, should be dipped upto 50 cm. at one end, in molten coal-tar, cooled and fixed in position into the ground. It will be better if one or two small 8-10 cm. long pieces of iron are nailed horizontally to the bottom of the bamboo (acting as holdfast) to secure it firmly. If AC pipes are used then they should be filled with lean cement concrete (1 : 4 : 8) and grouted upto 60 cm. below ground level in cement concrete (for that matter a hole of 20-25 cm. dia and 60 cm. depth should be made at the position).

B-Roof

The exact design of the roofing structure will depend upon the diamensions of the area to be covered. However, in general a sloping roof with 3 : 1 rise to span ratio should be made, using 7.5 cm. dia. bamboo, with a top ridge member, bottom eaves member and rafters at spacing of 90 cm. A 15 cm. square grid network made of binding wires (used commonly for binding steel reinforcement in RCC work) is attached tightly between the rafters.

Used gunny bags are opened up by removing the edgestichings, spread out and then restitched with each other to make large pieces (width of each pieces should be at least 20 cm. more than the width of the sloping roof surface). These large pieces are then used as roof covering by nailing them onto the rafters. Care should be taken to ensure that there is no sag in these pieces and they are held tightly and securely. The outer surface of the gunny bag roof cover is then painted with cement slurry (1 cement, 2 sand and water) using 10 cm. wide painting brush. After the slurry wash dries out, similar wash is done on the inner surface of the roof covering. Finally curing is done for about 6 to 7 days by moderately sprinkling water on the roof cover. During this period if some crackes are noticed in the dried slurry wash, the same is filled up by rapainting with the cement sand slurry.

NOTE :

1. Width of such sheds should not be more than 6 m. (or 20 ft.)
2. The bamboo should be joined to each other by nailing over them 25 mm wide thin mild steel strips at least 15 cm. long. In case of rafter-column joints, the length of the strips should be at least 30 cm.
3. In case of high-wind areas the sloping roof with ventilation system (design separately available) have to be used.

Cost : Cost of a 3.0 m x 3.0 m roof shed comes to Rs. 550.00 (Jan. 1989) i.e. Rs. 61.11 per square meter.

Thus it is a real low cost shelter, of course without walling. With additional cost appropriate walling can be made by using local materials and improved techniques like compressed mud blocks.

Uses :

1. Since construction of a 3.0 m x 3.80 m shed takes 5 days, the gunny bag roofing system is an excellent emergency shelter technique.
2. It can also be used effectively in low cost housing projects, school buildings, cattle sheds, community meeting places (Chaupals) etc.

Advantages

1. Field trials have indicated that no repair and maintenance is needed even upto 3 years (in appreciable rainfall regions).
2. There is no water leakage at all even during heavy rains.
3. Construction time is very low.
4. The construction technique requires no special materials, tools and techniques and is simple to be learnt by any person in a few days.
5. Affordable to the poorer section of the society.
6. Repair and maintenance is simple and cheap In case a hole is made (by impact of a sharp object), a patch of gunny bag may be stitched over it and painted with slurry. For routine maintenance slurry wash may be done once in two years.
7. Will cost Rs. 150.00 (for a shed of 3 m x 3 m size).
8. It has a high self-help component.

Disadvantages

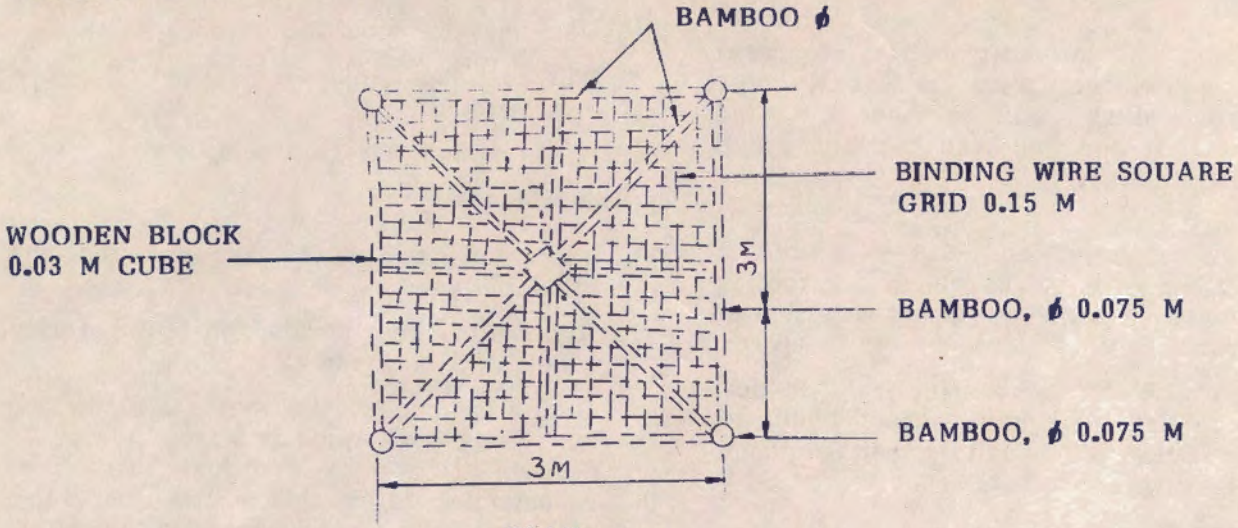
1. The roof top cannot be used for any other purpose.
2. If a sharp object strikes the roof covering a hole will be made in it.
3. During summer season the area below the gunny bag roof becomes warm. It may be desirable (if a little additional investment is possible) to provide a low cost false ceiling e.g. a thatch type false ceiling will cost Rs. 30.00 per sq. meter.
4. Cannot withstand cyclone or very high wind pressure.

Precautions

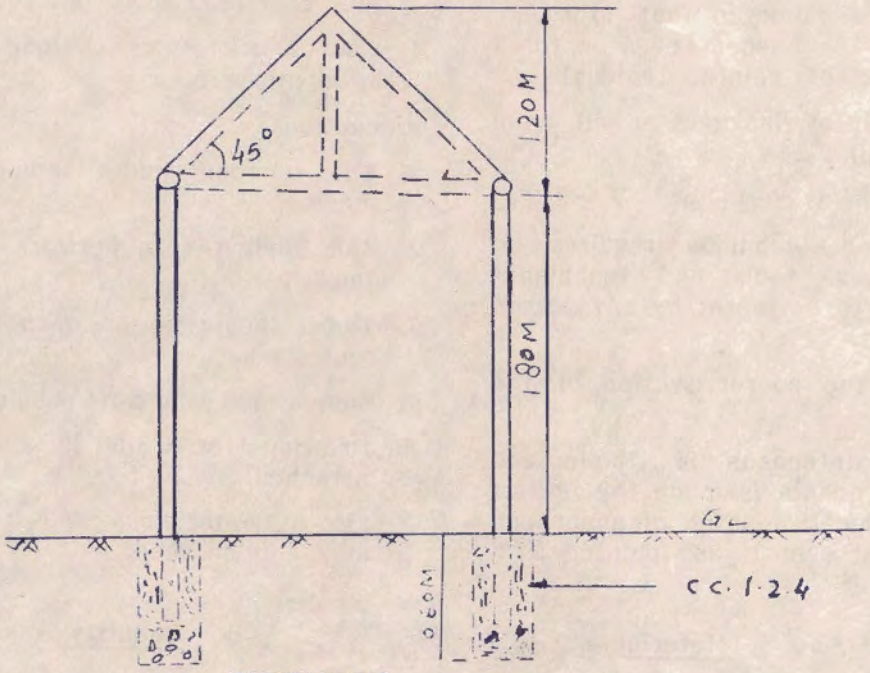
1. The bamboo joints should be carefully made.
2. The binding wire network should be fully taught.
3. There should be no open fires below the roof shed.
4. Cement and sand ratio should not be altered.
5. Drawing (for a 3.00 m x 3.00 m shed) is attached.

List of materials & tools required for 3.00 m x 3.00 m shed.

Sl. No.	Materials	Quantity
1.	Cement	2 bags (about 100 kgs)
2.	Fine sand	0.17 cu.m.
3.	Bamboo 7.5 cm. dia, 6.1 M length	6 nos.
4.	G.I. Wire 20G.	5 kg.
5.	Empty Cement bags	50 nos.
6.	Nails (2.5 and 10 cm. long)	1/2 kg.
7.	Sutli (string)	250 gms.
8.	M.S. Flat 3 m.m.	3 kg.



PLAN



ELEVATION

CEMENT TREATED GUNNY CLOTH ROOF

Tools

1. Wooden saw
2. Axe
3. Hammer
4. Trowel
5. Painting Brush (10 cm wide).

Contact Agency :

Centre for Development of Rural Technology,
I.E.R.T.
26, Chetham Lines,
Allahabad - 211002.

SAND BED FILTERS FOR SMALL GASIFIERS

The gas cleaning often appears as the weakest point in small gasifier plants for operation of engines, built in developing countries. Filter designs used in modern gasifier plants from Europe with glass-fibre fabric as filtering material, are considered too expensive. This leads to use of various locally available materials, normally with inferior filtering performance. Part of the problem is apparently the lack of design data for dimensioning of filters using cheap filtering materials.

At the University of Bremen, W. Germany, studies have been initiated to provide a basis for design of gas filters using a sand bed as filtering material. The experimental set-up is shown in Figure 1, and consists of a down-draft gasifier with a central air nozzle, a settling tank with a volume of 60 litre and a sand bed filter, see Figure 2.

Quartz sand with particle size 0.9 - 1.5 mm was used as filtering media. Tests were run at a constant gas flow of 15 m^3_N/h. Some test results are summarized in the table

	Dust content in gas, mg/m^3_N		
Fuel	Before sand bed	After sand bed	Pressure drop
Wood charcoal	80-200	2-10	From 2 hpa* to 4 hpa in 3-5 h
Wood	200	70-100	From 2 hpa to 20-30 hpa in 3-5 h

* 1 hpa = 10.1970 mm H_2O

It was found that the flow direction through the filter is quite important for the function. Flow from top to bottom eliminates problems which otherwise may arise as a result of condensation of moisture from the gas.

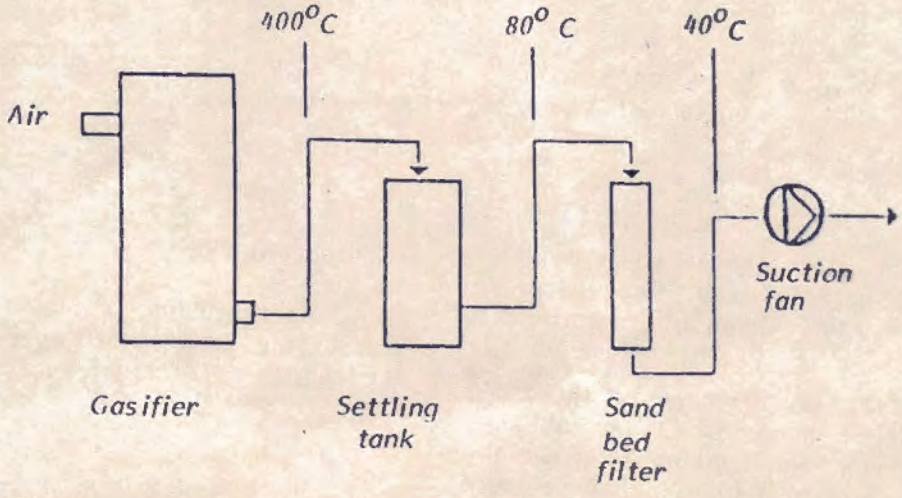


Figure 1. Charcoal gasifier with filter system.

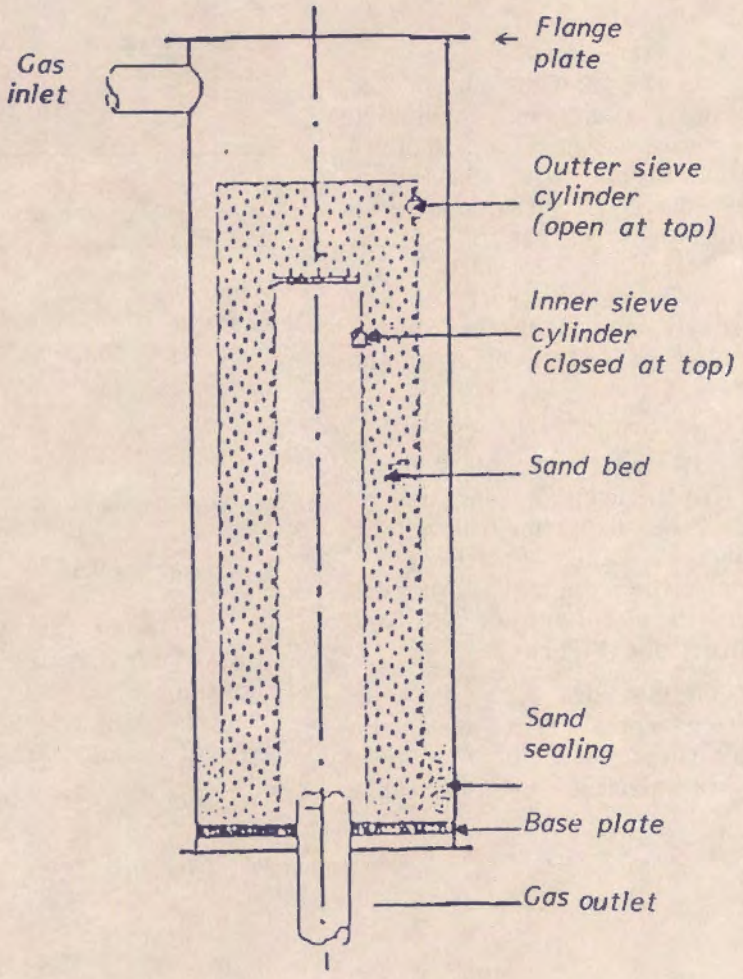


Figure 2. Design of the co-axial sand filter.

The performance of the filter was considered acceptable for charcoal gas. Changing of the sand every ten hours of operation is advised.

For wood gas the performance of the filter is not considered adequate. It is believed that use of finer sand might improve the filtration. It would also give higher pressure losses, however. Further studies of designs of sand bed filters for wood gas appear as necessary.

Contact Agency :

Bau und Erprobung einfacher Filter fur Kleine Gasgeneratoren (2-10 kW). University of Bremen, W. Germany.

BREAKTHROUGH IN TISSUE CULTURE OF OIL PALM

Scientists at the plant biotechnology section of the Bhabha Atomic Research Centre, Bombay have successfully used tissue culture for mass production of oil palm, a plant that holds considerable promise as an answer to the chronic edible oil shortage in the country.

Tissue culture studies on oil plam were initiated at BARC in 1987 under the Technology Mission on Oilseeds in a bid to develop alternate strategies to enhance edible oil production in the country. Oil palm (Elaeis guineensis) is perhaps the highest yielder of edible oil among plants, giving 2.6 to 3.7 tonnes per hectare compared to the meager 700 kg per hectare by traditional crops like groundnut, mustard, rapeseed and sesamum.

Scientists as BARC's plant biotechnology section headed by Dr. P.S. Rao, cultured the young leaves which were removed from the region of the growing apex cut a few inches above the growing point. They placed the leaves in an appropriate nutrient medium supplemented with growth-promoters like auxins and cytokinins.

Under these conditions, the cells of the young leaves are stimulated to divide rapidly and proliferate into a disorganised callus tissue which can be multipled and maintained as stock tissue.

By changing the components of the medium, BARC scientists manipulated the actively growing callus cultures to produce a large number of organised embryos. These somatic embryos were allowed to develop into leafy shoots.

The shoots were transferred to individual rooting media where they formed roots to develop into complete, small plantlets.

Apart from young leaves, plants have been regenerated from root segments, and inflorescence segments have also shown capacity for proliferation and callus formation, although plants are yet to be regenerated.

The tissue culture raised plants were transferred to soil in paper cups for eignt weeks, and thereafter for another eight weeks to earthern pots maintained in a greenhouse with high humidity conditions provided by a special mist spray facility. After acclimatisation in the greenhouse, the plants were transfered to soil.
"In general it was observed that the height of the plant was correlated to the survival rate. Plants which five to six inches high showed 100 per cent survival".

More than 100 tissue culture raised oil plams are established in the BARC nursery. About 50 are ready to be sent for the Department of Biotechnology's oilpalm demonstration project in Sindhudurg district of Maharashtra and another 50 to Karnataka.

POTENTIAL OILSEED CROP

A perfect dryland crop, admirably hardy and economically attractive, safflower (Carthamus tinctroius) has not received its due attention by agriculturists in the country. Safflower oil is rich in poly unaturated fatty acids (PUFA), a vital element in human nutrition. The oil is also a rich source of linoleic acid which forms the bulk of PUFA.

Increasing emphasis is being laid on safflower cultivation. Present R & D work focuses on the development of newer strains with higher yields on farm level, improved post-harvest techniques and better methods of processing seed for recovery of oil and protien - rich cake.

Post-harvest practices of sofflower employed for recovery of oil and protien-rich cake, especially in rural sectors, are inadequate and mainly confined to small scale operations. Research Institute (OTRI). Anantapur has shown the scope for improving existing practices in safflower seed processing. Cottonseed mills can process the seed without change in the equipment.

Dehulling is important as hulls of safflower seed are abrasive and tough. Their removal would improve the maintenance cost of the processing machinery and provide cake and meal which are wholesome feedstock materials.

The whole seed comprises a tough hull and a soft kernel within. Improved dehulling techniques will help produce kernel-rich fraction with as low as four per cent hulls. These can be crushed in expellers to fabricate a cake with a high protein content of 55 per cent and seven per cent oil.

The protein filled cake is an excellent source of edible flour. The studies have also shown the efficacy of dehulling safflower seed only a few days prior to expelling. This prevents the oil from having High rancidity.

Both raw and refined safflower oils are characterised by their short shelf life. While the former is comparatively stable towards autooxidation, the refined variety namely devoid of natural antioxidants has a very short shelf life. It should therefore, be incorporated with external (synthetic or natural) antioxidants to prevent the on-set of rancidity.

Auto-combustion is common in safflower cake when packed in gunny bags and kept in ill-ventilated godowns. High humidity and stacking of the bags are possibly the main reasons for this combustion. Filter cloth used for oil separation might catch fire in similar conditions .

Through safflower oil is of a high grade edible quality, it is used extensively in non-food industries. It is used in the manufacture on non-yellowing alkyd resins and surface coatings, afridi wax which find applications in lacquer works and linoleum. Sulphonated oils made from safflower oil are good substitutes to Turkey Red oil which is used as fat liquors in leather industries and as auxillaries in textile units.

IRON CHLOROSIS IN SUGARCANE

Iron chlorosis in sugarcane is prevalent in northern Telangana of Andhra Pradesh. It is caused due to absence of iron supply from the soil to sugarcane. This may be a result of high pH, low temperature, imbalance of metals like copper and manganes with iron, excess phos-phorus and calcium which convert available iron into an insoluable form and consequently, its unavailability.

The symptoms of iron chlorosis are seen in young leaves which have pale stripes with reduced chlorophyll content between the parallel veins. In severe deficiency, the intervenal areas of younger leaves turn pale cream. The larger veins are sharply demarcated while the order leaves retain their dark green colour.

In advanced stages, marked contrasts often occur in the leaves where the youngest may be entirely white with no green even in the veins, the intermediate leaves partially green and the oldest leaves are subnormal green.

Iron chlorosis can be corrected by spraying three per cent (30 g per litre of water) ferrous sulphate or ferrous ammoniumsulphate in combination with 0.3 per cent (3 g per litre of water) citric acid solution once on the 30th day and then on the 45th day of planting.

A content of 5-10 ppm iron in the leaves is considered the critical limit. The results of studies on iron chlorosis of sugarcane in northern Telangana have however shown that chlorotic leaves also have a high iron content, indicating this may not be the base for determining iron chlorosis.

MOVE OVER MERCEDES, SOLAR CAR ARE HERE

In the land of broad beamed Mercedes, 12-cylinder BMWs and the high speed autobahn, a small group of thinkerers and enthusiasts is working on a car of the future that follows a completely different line of development: solar powered city cars, small and light, with battery-charged top speeds around 70 km per hour.

"Where we are now is one second after the birth of this idea."

"We have to ask ourselves, what will individual transportation look like in the next century." Besides the problems of

pollution, noise and croweded streets, oil industry projections say world petroleum reserves will run out by around the year 2030.

To suggest some answer, Mr. Clef Prahm and friends organised West Germany's first major road rally for solar vehicles, the Hansa Solarmobile Cup from Luebeck to Hamburg, inspired by Switzerland's annual Tour De Sol.

Some 80 solar-powered cars, motorcycles and mopeds from West Germany, Denmark, Switzerland and the Netherlands converged on northern Germany for the 190 km run in September.

According to solar enthusiasts, the car of the future will not simply be electric. It must be energy efficient, meaning light and no more than three metres long.

Solarmobiles built in small series in Switzerland and Denmark have sleek hulls of strong, light weight synthetic materials with highly energy efficient engines and extremely low wind resistance values.

Solarmobiles convert 70 per cent of their energy input into motion compared to 20 per cent at best and as little as five per cent in the city for regular cars.

There is a new concept of traffic behind these autos." It is based on statistics : West German studies show that the average urban car trip takes one or two people some 20 km and that drivers cover and average 44 km a day.

Hence the solar city car, with one or two seats and able to carry 40 to 50 per cent of its own weight, with a top speed of around 70 kph and a range of 70 or 80 km on a single battery charge.

GOOD WATER AND NUTRIENT MANAGEMENT

"The impact of good water and nutrient management on coconuts is spectacular. Our coconut yields have doubled once we ensured adequate irrigation and balanced fertilizers," says Mr. A.R. Appukuttan Nair, a young progressive farmer of Edavilakathuveedu village near Amachal in Kattakada Krishi Bhavan of Kerala.

The 350-coconut trees in the age group of eight to 25 years, were left uncared for until a few years ago and they yielded on an average 500 nuts a month. The trees looked unhealthy, and were susceptible to several pests and diseases. "Only in the last four years have we arranged for the drip irrigation system, and started manuring them properly. We have terraced the entire grove, and dug up trenches to harvest and store rainwater."

The effects of irrigation and fertilizer application were dramatic. The average monthly harvests have increased to 1000 nuts now, and this figure is likely to go up still further. The health of the trees improved significantly and West Coast Tall trees have responded particularly well to irrigation and nutrient application.

After applying about 40 kg of biogas effluent slurry per tree a fertilizer dose of 1.5 kg coconut mixture (NPK 10:5:20) was applied in April, and only the affected portions of the trees were treated with insecticides such as Metacid or Nuvan. The red palm weevil, which attacked the trees severely has been totally eliminated, and other pests and diseases are also on the wane, according to Mr. Nair.

"I designed my own method of drip system, and it gives about 40 litres of water per tree in two hours each day. The irrigation time and quantity of water would be reduced in the cool seasons, and our watering schedule is based on the soil moisture regimen," he points out.

The cost of manpower and electricity for irrigating the coconut grove works out to Rs. 33 a day, and the fertilizer cost is about Rs. 10 per tree. The income from 1,000 nuts is quite remunerative. After getting the water on a regular basis to the farm, the farmer has taken to raising banana, pepper and fodder grass in the interspaces. Different varieties of banana such as red banana, Nendran, poovan and cavendish are grown along with yam and fodder grass to augment the farm income.

The productivity of the lateritic soil has in

creased considerably, and the farm income has also improved. The soil and water conservation measures have helped greatly in improving fertility of the land, and bettering the crop output, according to Mr. Nair. The plant protection measures have also paid rich dividends, and the loss of crop due to pests has been totally prevented.

According to Mr. K.Subramaniam, Deputy Director of Agriculture (Credit), Department of Agriculture (Credit), at Trivandrum, this coconut grove is a model for others to follow, and the increased coconut yields in the farm have encouraged many other coconut growers in the region to come forward to dig wells and take up new water management techniques such as drip system and sprinklers. The terraces and trenches along the contours is also becoming popular in the area now.

MEET ON BIOGAS IN PUNE

India's expertise in biogas technology and its potential for the energy sector will provide the framework for an 'International conference on biogas technologies and implementation strategies' scheduled to be held in Pune.

Sponsored by Bonn's ministry for economic co-operation (BMZ) and the Indian energy ministry's Department of Non-conventional Energy Sources in close co-operation with the Bremen Overseas Research Development Association (BORDA), the holding of the conference in India is being seen as a tacit recognition of India's successful track record in the use of biogas techniques and is being looked forward to for throwing up fresh proposals towards formulating a biogas strategy that will consider India's experience hitherto as a take-of point for enlarging on the uses of biogas and refining its applications.

The conference will see the participation of 37 developing countries and several multilateral organisations as also non-governmental organisations and will focus, among others, on the Indian and German biogas experiments, with emphasis on high-tech biogas plants. Its deliberations will cover aspects such as intensified processes of methane production, sewage treatment by anaerobic digestion, treatment of waste from industrial processes, biogas plants for large farms and animal breeding stations.

India and China have come into the limelight in the use of biogas, with the latter claiming some 4 million biogas units in operation as compared to approximately one million units in India. However, there has been an increasingly close co-operation between India and the Federal Republic of Germany in the shift of focus of development policy from large industrial projects to small schemes for promoting a system of decentralised energy supply for the poorer classes. In particular, BORDA has been active in promoting biogas plants in Maharashtra over the last five years.

The rise of ecological consciousness in both industrial and developing countries worldwide has led many in recent years to install pilot plants for biogas to cope with economic as well as environmental questions. Sri Lanka, Nepal, Kenya, Burundi, Tanzania, Thailand and others are reported to have launched national programmes to implement biogas technology, mainly in rural areas.

The Pune conference is expected to provide a forum for all countries to exchange notes with those enjoying longer experience with biogas programmes. Many will be looking for information on installing biogas plants on a large-scale. The meet will also highlight the use of biogas in their financial and socio-economic aspects as well as their evaluation and monitoring.

Bonn has of late been laying much store by the efficacy of this energy source.

Perceptions of India's potential in biogas have been extremely positive. With an estimated 90 million tonnes of cattle dung per year produced in the country and with over 30 per cent thereof burnt in the form of dung cakes, the indications, especially for rural households, is obvious. Addanother 40 million tons of farm waste and one has a

pretty picture of developmental possibilities.

Participating in the Pune conference will also be guest speakers from Germany, Japan South Korea, United States and the Neitherlands who will deliver technical lectures and present case studies that will be of guidance to planners and administrators for future strategies of implementation.

JASMINE CULTIVATION IDEAL FOR SMALL AND MARGINAL FARMERS

JASMINUM sambac. Var. Heaynum (family : Oleachae), popularly known as 'Udupi Mallige' in Dakshina Kannada district is a jasmine cultivar grown in small and upland marginal holdings in villages such as Shankarapuram, Katpady and a few other places around Udupilts cultivation in this locality is traditional where bushes aged more than even 70 years are noticed. With good keeping quality of flower buds and pleasing and characteristic fragrance of flowers, Udupi Mallige is not only the favourite of the coastal belt, but has also captured the elite class residing in distant metropolitan cities such as Bombay, Ahmedabad, Delhi and Madras.

Jasmine plants are bushy in habit, growing to a height of 1 to 1.5 metres and covering an area of about one square metre. Its cultivation initially involves opening of pits (0.6 metre cube at 1.8 metre apart). Rooted stem cuttings or ground layers are planted in the pits during August.

Planting under shade is avoided, as they need sufficient sunlight, Normally, it is a practice to apply well decomposed farm yard manure twice a year, once in May-June and Later on, in January-February, at about 20 kg per dressing per plant.

Besides, fertilizers at 120 : 240 : 240 gm NPK per plant are applied every year in two split doses along with farm yard manure. These are supplemented with neem cake provided at 500 gm per plant, oncee in two months. Irrigation is done once a week from October-November onwards, depending on the soil mositure conditions.

The cultivation of Udupi, Mallige is highly labour intensive; but mostly, the female members of the family are drawn, particularly for the daily picking of the flower buds. The plants commence flowering six months after planting and there after, they continue to bloom almost throughout the year.

Studies have shown that the plants blossom from March onwards up to October with peak flowering in April. During the winter months (November to February), flower production is considerably less.

White flies, mealy bugs and rust are the main pests and diseases in the crop. These can be controlled by prophylactic plant protection measures.

The plants yield even up to 7,500 kg an hectare of flower buds every year. The margin of profit is substantial as the gross income is around Rs. 1.13 lakh an hectare from the sale of flowers, rated modestly at Rs. 15 a kg. as the cost of cultivation is only around Rs. 35,000 an hectare. So, even a small farmer with an area of 400 sq. metres can earn a net income of Rs. 3,000 from its cultivation, apart from providing employment to his household members throughout the year.

PROMISING COTTON HYBRID

EFFORTS to develop a medium staple short duration interse-hirsutum hybrid, better than the existing hybrid JKHY-1, resulted in evolving ICMF-HH-14 at the ICMF-CDRA

Cotton Research Farm, Nandyal. This hybrid is suitable both for Kharif and Rabi conditions under irrigation and has been found to have greater tolerance to whitefly than JHKY-1.

As regards yield, ICMF-HH-14 had an average of 3128 kg/ha in contrast to 2720 kg/ha for JKHY-1. It scored in ginning (36 per cent against 34) and in staple length (26 mm against 25) too.

In holdings at Kurnool and Adilabad districts, ICMF-HH-14 yielded on an average 29 qtls/ha against 26 qtls/ha of

JKHY-1. As for final harvest, ICMF-HH-14 takes 160 days against 170 days of JKHY-1.

The flowers of ICMF-HH-14 are cream white with buff pollen. The bolls are big and mostly five loculed. The seed rate is 2.5 kg/hs. The spacing to be adopted under irrigation is 120 cm between rows and 60 cm between plants with a single plant per hill. The crop requires a fertilizer dose of 120 kg nitrogen, 60 kg phosphrous and 60 kg potassium per hectare with 60 N, 60 P and 30 K kg/ha as basal and the rest of N and K in three split doses at 40, 60 and 75 days after sowing.

POWER FROM RICE STRAW DELAYED

A unique project to produce electricity from rice straw in Punjab will not go an steam as scheduled because the Government, the Department of Non Conventional Energy Sources and equipment suppliers BHEL are squabbling over import duties.

A joint venture of the Department of Non-Conventional Energy Sources and the Punjab State Electricity Board, the Government okayed the setting up of the Rs. 25 crore plant two years ago. The 10 MW rice straw project in Jalkheri near Sangrur is the first of its kind in the world and when complete is expected to meet the power needs of some 400 villages nearby .

The present controversy means a delay of more than six months in the commissioning of the project. The earlier deadline was April 1990.

It was clear right from the start that though BHEL would supply the boilers, turbines and generators for the pilot project, one particular item, the fuel feeding and firing system, would have to be imported. This is the part that lifts the bales of rice straw and feeds it into the boiler. While the item was to be covered by DANIDA (a Danish aid agency), the Department of Non-Conventional Energy Sources promised BHEL complete exemption of customs duty when it imported the equipment.

The problems began when a plant to produce electricity from waste in Timarpur, which had been set up with DANIDA aid, failed to generate the anticipated 6 MW of power. While the Department of Non-Conventional Energy Sources blamed the equipment suppliers Wolund of Denmark, the latter in turn claimed that the waste material used was of poor quality in terms of its heating value. As a result of the wrangle, DANIDA, which had funded the supply of the equipment, withdrew aid for the rise straw plant import.

At this stage, BHEL expressed its readiness to procure the equipment provided it got import duty exemption. The order was placed with JR Knutsen of Denmark and the machinery is expected in a couple of months. But now, there is considerable uncertainty be cause the Department of Economic Affairs has taken the stand that farm machinery is not entitled to such a waiver.

The question 'who will pay the customs duty 'has risen. While Punjab State Electricity Board, the final owners of the plant, have said 'No', the Department of Non-Conventional Energy Sources feels it has already put Rs. 11 crore into the project and it can't foot the additional bill.

While the disagreement and confusion persists, it has also resulted in an import order for another essential component, the fuel collecting system (the machinery which will collect the loose rice straw in the fields), not being placed. BHEL doesn't know whether it needs to place such an order. Indeed, thanks to the present controversy, the company isn't even sure it should.

All this means that the cost of the project has escalated and continues to with every passing month. By current estimates, the project cost has already gone up to Rs 40 crore (The earlier estimate of Rs 25 crore was based on import duty exemptions). If the second component, the fuel collecting system, is also required to pay customs duty, the rice straw project could end up costing twice the projected amount.

Given the unique nature of the project, the Government's attitude is difficult to comprehend. The rice straw project affords several advantages. For instance, the straw now lies uselessly in the field and besides going waste also causes pollution when farmers burn the straw to dispose it. The Jalkheri project offers farmers an additional source of income because the rice straw will be bought from them at a reasonable price.

Besides, the Government intends to generate 15,000 MW of power from new and renewable sources of energy by the year 2,000 . With such an unsympathetic attitude to a bold new R & D project, it should be a pleasant surprise if this goal is indeed realised.

CATRA STOVE

Scientists at the Centre for Technology for Rural Areas (CTARA), Bombay, have developed a single pot wood-burning stove which incorporates the following features : converging combustion space, a grate, preheated secondary air and a swirling device. Using chipped wood and a large-diameter vessel (30 cm), efficiencies greater than 40 per cent have been recorded .

Studies conducted by the CTARA scientists and the Mechanical Engineering Department. Indian Institute of Technology, Bombay have shown that about 50 to 80 grams of small chipped wood are essential for starting the fire within 60 to 90 seconds. The most convenient way of starting the fire is to use a kerosene swab (steel rod wound with asbestos rope and dipped in kerosene). The flaming swad is inserted below the grate on which the chipped wood is placed. Once the chips catch fire, the swab is removed.

Other conclusions drawn from pilot tests conducted by the scientists are that species like mango, subabul and other jungle woods are easier to burn than soft furniture wood, and that wood ranging from small chips (2 x 0.5 x 12 cubic centimeters) to large branches (with a diameter of 5 cms and a length of 60 cms) can be used for sustained burning.

Use of perforated cylinders helps to burn wood more quickly and drastically reduces the smoke density because of mixing of secondary air, according to a report by CTARA scientists S. Bhandr , S. Gopi and Anil Date. The efficiency can also be improved by reducing the diameter of the metallic cylinder to equal the throat diameter of the clay cone, so that the flames do not flare too quickly and they hit the pan directly. Other factors that improve efficiency are perforating the cylinder, providing an incline to the horizontal part of the metal cylinder and imparting a swirl to the combustion products.

NEW TECHNOLOGY FOR BUILDING

Gone are the days when building a house meant endless travails and trips to the contractor and managing the labour so that the house comes up inch by inch. Thanks to the prefabricated construction technology it is now possible to build a house overnight.

This new technology, relying on Lincrete System, offers to the builders a compact construction system that also effects economy in labour and time. The system brought from down under through an Australian company, M/s. Allen International provides the capability of erecting houses within no time.

Mr. S.K. Sharma, chairman-cum-managing director, Housing and Urban Development Corporation, inaugurated a sample house constructed with the aid of prefabricated concrete slabs at Sarai Kaley Khan in South Delhi.

LADIES FINGERS

Ladies fingers seed powder added to water is not a suggestion for a recipe but a possible method to make turbid waters clear.

Seed powder of ladies fingers, the popular vegetable that is botanically known as Hibiscus esculents botanically and 'bhindi' in Hindi, when added to water serves as a

coagulant and makes it less turbid, scientists have reported.

This natural electrolyte property of ladies fingers was discovered by scientists at the National Environmental Engineering Research Institute, Nagpur. Polyelectrolytes are coagulant aids that reduce the requirement for metal coagulants and improve the physical characteristies of flocs, resulting in better quality of the treated water. Natural polyelectrolytes are proteins, protamines, nucleic acids, pectic and alginic acids, polysaecharides and numerous polyacids.

The NEERI scientists prepared a dilute solution of the seed powder and tested the effects of varying doses of the powder, both treated and untreated with ammonia, on the turbity of water.

In the experiments, the seed powder proved to be a good primary coagulant in clearing water and can replace conventional alum coagulants, NEERI scientists M.V. Vaidya and M.V. Nanoti said reporting their finding in the "Indian Journal of Environmental Health" Also when the powder was treated with ammonia, coagulation improved, both in low and high turbidity ranges, whereas untreated powder is not effective at higher turbidities.

The new method can also considerably reduce the cost of treatment at higher turbidities compared to alum.

However, one drawback with bhindi seed powder is that its solution deteriorates with ageing even after treatment with ammonia.

BREAKTHROUGH IN CULTURE OF RARE MEDICINAL PLANT

The scientists, reported their findings in an international journal, said they adopted a new approach by encapsulating the apical and axial shoot buds in calcium alginate beads. Ninety-eight per cent of the buds developed into plants in test tubes 90 per cent of these these test-tube raised plants were fully transferred to pots outside the laboratory.

The journal Agricell commented that instead of encapsulating somatic embryos, as was done in many western countries, the CIMAP scientists tried to encapsulate the apical and axial buds, which appeared to be a more direct and practical method of commercial propagation of the plant.

The CIMAP scientists have found that encapsulated seeds can be preserved at four to six degrees Celsius in miniral oil for over six month without loss of viability.

Addition of anti-malarial agents to the beads allows the direct translation of in vitro results to field conditions.

The simple technique can be applied for many species that are now being propagated through tissue culture techniques.

THE COLIPHAGE TEST KIT

Dr. Wang Chee Woon, associate professor of biochemistry at the University of Malaya in Kuala Lumpur, Malaysia, has been developing a simple coliphage-detection kit as part of the IDRC-sponsored water quality research network.

He says the kit is much simpler and more economical than commercial kits and it permits more water points to be tested for microbiological quality. It is designed for use by rural communities and Ministry of Health personnel, and can be used by anyone with three years of high school education.

Dr. Wang and his colleagues initially tried the coliphage technique on 200 water samples. Then they produced and tested the first prototype kits, each capable of handling eight samples. A second kit, with a 10 sample capacity, is now in the works.

A major advantage of the coliphage test is that the incubation temperature of the water sample is relatively low: 27 to 31 degrees Celsius, which is just above room temperature. Standard coliform tests, on the other hand, require a temperature of 35 degrees. The latest kit design contains an insulated water sample holder for use in cool, mountain villages.

The tiny disks of filter paper hold the specially dired E. coli host bacteria,

extending its self life to upwards of three months. The mixture is poured into four petri dishes and left overnight to incubate. Round clear spots (or "plaques") in the dishes indicate areas where the host bacteria have not grown because of the presence of coliphages. The larger the number of spots, the more coliphages there are in the water sample, thus indicating contamination with fecal coliforms that include E. coli.

PUMPED STORAGE POWER PLANT

A pumped storage power plant equipped with reversible-type hydro-electric sets for generating power as well as pumping water has been commissioned for the first time in the country by the Bharat Heavy Electricals Limited (BHEL).

During peak demand, the sets generate power (in the 'generating' mode), and during lean demand, the sets pump (in the 'pumping' mode) the discharged water back to the main reservoir, thus conserving water.

BHEL's first such plants the Kadamparai Pumped Storage Power Plant, was commissioned recently in Tamil Nadu. This power plant, utilising the waters of the river Kadamparai, is equipped with four reversible -type hydro electric sets, each with a rated capacity of 102 MW for generating power and 107 MW for pumping water, with the normal operating speed of 500 revolutions per minute.

The turbines and generators are equipped with electro-hydraulic governor and static excitation equipment. In addition, sequence control panels, a static frequency converter, an auto-synchroniser, a solid-state alarm annunciator, sequence event recorder, data logger and static protection relays are provided for start-stop control, normal running monitoring and protection of generator-turbine sets.

The sets can be operated in four different modes : generator, synchronous condenser ('generating' direction), synchronous condenser (pumping direction), and pump. The pumps can be started either by variable-frequency starting or back-to-back synchronous starting. For braking, three different methods, regenerative, dynamic and mechanical can be used.

The variable frequency starting method employs a static frequency converter whereby the output frequency is varied from 0 to 50 Hz automatically to accelerate the motor. With this equipment it is possible to start (sequentially) and operate all the four sets in the pumping mode. In back-to-back synchronous starting two sets are connected in parallel. One set is started as a generator while the other connected set gets accelerated as a motor. This starting method would be used as a back-up if the static frequency converter is not avaulable due to any failure.

The start-stop sequence control is designed to achieve any combination of the starting and braking methods and operating modes ; fully automatic control is effected from the control room. The sequence event recorder enables automatic recording of alarm signals.

The static excitation equipment automatically regulates the power factor for the 'pumping' mode, in addition to performing the normal functions, a separate static excitation panel provides excitation during back-to-back starting, variable frequency starting and dynamic braking.

The electro-hydraulic governor used is equipped with the necessary control devices and circuitory to ensure proper functioning under the modes of operation. This includes normal frequency control, load variation under the 'generating' mode and operating the set at fixed guide vane opening under the 'pumping' mode operation.

A VERSATILE SOLAR DRYER

A simple, foldable solar dryer has been designed and fabricated by the food

technology and enzyme engineering division of the Bhabha Atomic Research Centre (BARC), Bombay for the preparation of raisins from grapes.

This dryer will be very useful for small farmers, most of whom depend on sun drying to preserve this seasonable and perishable commodity. But sun drying has its limitations and inherent problems.

The foldable solar dryer, with a capacity of 20 kg of grapes, can bring down the moisture content to 16 per cent in just four days. Experimental runs carried out at BARC have indicated that both volume and moisture content of grapes decrease by a factor of about five during this period.

The dryer can be easily fabricated, using commonly available materials. The cost of the unit will be less than Rs. 2000 and is expected to decrease on mass production.

The quality of the raisins prepared by using the solar dryer was found to be good even after five months of storage at normal temperatures. The dryer is versatile and can be used for drying other products like green chllies, pepper, and 'papads'.

SEARCH FOR PETROL TREES

The sun holds the key to almost all the energy resources of future. We can tap solar energy either directly for heating, cooling, refrigeration crop drying etc,or indirectly by growing plants which capture solar energy in the form of light and convert it in to food (carbohydrates), material (cellulose) and fuel (hydrocarbons) through photosynthesis. If plants are grown systematically and managed properly they can provide bulk of energy required by man.

In the present decade scientists have discovered certain plants which during their normal growth produce oil resembling petroleum. Pertroleum is a mixture of hydrocarbons ranging from C-1 to C-40 and is found under earth at different depths, on fractionation crude oil gives different fuels of domestic and commercial use. Establishment of energy plantations of quick growing fuel-producing plants could be a very workable solution to the energy crisis.

The tree species jojoba, capaiba, and leucaena lencocephela are known as "petrol-producing" trees but they are not only ones. Let me tell you about a few other species which add up to a tremendous reservior of non-conventional energy.

The most important plant which produces hydrocarbons directly is the rubber tree (Hevea brasiliensis). Oil in the form of latex is collected by drilling a small hole in the tree trunk. The oil has similar chemical composition to petroleum but the hydrocarbons differ in their atomic arrangements and molecular weight distribution . The molecular weights of these hydrocarbons are in the range of 10^5 to 10^7 which is comparatively high and excludes their direct use as fuel. However, the possibility of using hevea oil as a fuel is being explored by controlling the molecular weight of the hydrocarbons upto 10^4 before harvesting the product. At present, it does not seem advisable to modify

Many other rubber plants (Euphorbia) are known to grow under less humid and tropical conditions and on non-productive land. One of these species, Euphorbia tericauli, also known as milk bush, grows in Brazil in very arid regions. It is an excellent species for a petrol tree plantation. It yields hydrocarbons in the form of latex, is abundantly available in India and can grow in dry areas.

Other species of Euphorbia such as Elathyrus, also known as gopher plant, and E. trigone, are other possibilities. The thick white sap of the gopher plant is an emulsion containing 30 to 40 per cent hydrocarbons and closely resembles crude oil. This plant can ordinarily yield 10 to 12 barrels of crude oil per acre. The Crude oil can be processed to get petrol and other petroleum products by fractional distillation.

Milk weed, of the genus Ascelpiadaceae, which grows profusely in dry regions and has the capability of producing hydrocarbons is another excellent species for the petrol plantation. The yield of

hydrocarbons in all these plants can be further improved by modern agronomy.

Ak (Calotropis procera) is distributed in the hot and dry part of India, Afghanistan, Egypt, Africa etc. It generally grows on waste land, dry places, river beds, roadsides and forest clearings. This herb can be used as renewable source of hydrocarbons and intermediate energy source because all parts of the ak plant are rich in hydrocarbons. Carbons, hydrogen and oxygen percentage in the extract of the whole plant are 78.03, 11.22 and 10.71 respectively. The percentage of carbon and hydrogen is similar to crude oil which suggests that this plants can be used as a substitute for petroleum or petro-chemical feedstock. The plant is fast growing and has sufficient amount of hydrocarbons to meet the increasing demand of peroleum at low cost.

Water hyacinth (Eicchornia crassipes) one of the most trouble some weeds in the world, appears to be another viable proposition for assuaging world's energy crisis. It has a tremendous capacity to grow and regenerate. Even a small piece of the plant can produce a full crop with in a short span of time and a crop of water hyacinth can double itself within eight to ten days.

The weed is a blessing in disguise in as much as it offers an alternative for natural gas. We are already aware of biogas in the form of gobar gas. The process for hyacinth gas is almost the same but it is preferable to use water hyacinth rather than cowdung for gas production because hyacinth decomposes faster than cowdung.

Research carried out at the US National Space Technology Laboratory in Florida have shown that 374 litres of biogas containing 60 to 80 per cent methane can be produced from one kg of drid water hyacinth. The fuel value of this biogas has been calculated to be 21,000 BTU (British Thermal Unit) per cubic meter which is satisfactory enough. Water hyacinth harvested from one hectare could produce more than 70,000 cubic meters of biogas.

The Central Mechanical Engineering Research Institute, Durgapur, has designed a continuous feed plant for generating combustible gases from water hyacinth. Similar studies are in progress at HAU, Hisar, IIT, Madras, and the Regional Research Laboratory, Jorhat. The total available energy from water hyacinth, in India, is estimated at 1.33×10^9 k cal per year plus Rs. 2.25 million worth of compost. Biogas so obtained can be used for cooking, heating, lighting and even as a source of power for engines, tractors and cars, after removal of carbon dioxide. Besides producing biogas, water hyacinth can be used to treat sewage and to fight water pollution.

Hydrocarbons photosynthetically produced by plants are promising substitutes of fossil fuels. The crude oil can itself be used as feedstock in the chemical industry. Work in this direction at present is being carried out at University of California (USA) by Professor Melvin Calvin, who has started an experimental plantation in southern California. These hydrocarbons can even be substituted for petrol with proper refining.

ELECTRICITY FROM CHARKHA

The importance of animal power as a source of energy for meeting a variety of rural needs has been well-recognised . In order to tap this underutilised potential, the Department of Non-conventional Energy Sources has sponsored several projects for harnessing animal power for generation of electricity. One such project is being carried out by the National Institute for Training in Industrial Engineering. Its main objective is to develop a device suitable for converting and storing animal power to a more convenient form of energy for various uses in the rural sector.

Three different design alternatives have been analysed . The rugged ghani type of design has been taken up for further development. Three prototypes have so far been fabricated and tried. The system is based on low-level technology using simple gears on conventional

automobile generator. The gear mechanism steps up the input revolution of 2.5 to nearly 2500 which is then fed into DC generator. The power produced is stored in the batteries.

Proposals for coupling potter's wheels and other systems to small generating systems are also being worked on. Mr. Ashok Rai of New Delhi has undertaken energy generation from movable manually - operated technologies particularly based on potters wheel, fodder cutter, and bullock-cart wheels. The DNES is in touch with him for the development, demonstration, and popularisation of these devices in the rural sectors.

Mr. Rai has also developed a device to generate to meet limited domestic needs using the Charkha. He has connected the Charkha to a low-cost generator through a gear. By turning the Charkha, the generator could be worked, to charge a 12-volt battery in an hour.

The trouble with people is not that they don't know but that they know so much that ain't so.

- Henry Wheeler Shaw

ANNUAL CONVENTION OF BIOENERGY SOCIETY OF INDIA

Sixth Annual Convention of Bioenergy Society of India will be held at Madurai Kamaraj University, Madurai from 29th - 31 st January 1990, organised by its Tamil Nadu Chapter.

The convention aims at bringing together a variety of experts (scientist, economists, foresters, extension specialists, sociologists, technologists, planners etc.,) system managers, voluntary agencies, and like minded personnels on a common platform to discuss and evolve approches to practical problems on regional bioenergy issues. The convention will cover the following areas for discussion.

i Bioenergy problems, prospects and retrospects,

ii Bioenergy production, conversion and utilisation,

iii Fuel wood production and improvement,

iv Energy plantation on waster lands,

v Solid ,liquid and gaseous fuels,

vi Technology development and implementation ,

vii Bioenergy planning and management ,

viii Environmental issues.

For further information contact :

Dr. T.M. Haridasan
Organising Secretary
Bioenergy Convention
School of Energy Environmental & Natural Resources,
Madurai Kamraj University,
Madurai - 625021

COMMUNITY DIAGNOSIS AND NEED ASSESMENT

Voluntary Health Association of India (VHAI) is going to conduct a five days Training Programme on "Community Diagnosis and Need Assesment" from February 5 to 9th February 1990 at VHAI, New Delhi.

The course is open to all those wishing to start a community health project in their area.

For further information contact :

The Coordinator,
Community Health Division
Voluntary Health Association of India
40 Institutional Area,
South of IIT,
New Delhi - 110016

INTEGRATED RURAL DEVELOPMENT

RUSHA (Rural Unit for Health & Society Affairs) will conduct a "Post Graduate Certificate Course in Integrated Rural Development' from mid August to mid December every year.

Eligibility for addmission in the course is graduate in any discipline or at least three years grassroot level experience for non graduates.

For further information contact :

RUHSA Department
CMC Hospital
RUHSA Post - 632209
North Arcot Dist.
Tamil Nadu

ENVIRONMENT IN ASIA AND THE PACIFIC

The Economic and Social Commission for Asia and the Pacific (ESCAP) will be convening a Ministerial Level conference on the Environment in Asia and the Pacific", in 10 - 16 October 1990. In the hope of improving networking and the perceived status of NGOs ESCAP is additionally proposing to held a Symposium for NGOs as part of the overall programme of the Ministerial Level conference, immediately prior to the conference.

For further information contact :

Mr. K.F. Jalal
Chief, Division of Industry,
Human Settlement and Environment
Economic and social commission for Asia and Pacific
The United Nations Building,
Rejadamrern Avenue
Bangkok - 10200
Thailand

ENVIRONMENTAL PLANNING AND MANAGEMENT

Development Planning Unit (DPU) London is organizing an 10 week program, "Environmental Planning and Management ; Policies, Practices and Institutes" from July 2 to September 21, 1990. It comprises five two - week courses that can be attended separately : (1) Environment and development (2) Pollution abatement (3) Water resources management (4) Energy Management and (5) Environmental institutions.

For further information contact :
Admissions Secretary
Development Planning Unit (DPU)
9 Endsleigh Gardens
London WCIH OED , U.K.

ENVIRONMENT AND DEVELOPMENT

The United Nations is organizing an International Conference on the Environment and Development in 1992 and needs papers from non-governmental oganizations (NGOs) on the theme of sustainable and environmentally sound developmentns.

For further information contact
United Nations,
NGO Committee on Development
Environment/Development
Non-governmental Liaison Service
D C2 - 1103, Two UN Plaza
New York
NY 10017 - U.S.A.

SCIENCE AND TECHNOLOGY FOR RURAL INDUSTRIALISATION AND RURAL DEVELOPMENT

Institute of Engineering and Rural Technology (IERT) will hold a Workshop on "Science and Technology for Rural Industrialisation and Rural Development" sponsored by Department of Science and Technology, Government of India, from February 3rd to February 5th 1990 at I.E.R.T. Allahabad.

Topics to be covered in workshop are : (i) Nature and problems of rural industrialisation (ii) Feasibility studies (iii) Industrial Estate as a tool for rural industrial development, (iv) Marketing and information system (v) Role of unemployed technologist in rural industrialisation (vi) Role of rural banks (vii) Research, development, quality control and training for rural industries, (viii) Role of Khadi and Village Industries Commission/State Khadi and Village Industries Board. (ix) Checking out plan of action .

For further information contact :

Prof. S.K. Narayan
Institute of Engineering & Rural Technology
26 - Chatham Lines
Allahabad - 211002

MANAGING RURAL DEVELOPMENT

Continuing Education Center, Asian Institute of Technology will hold a "Training Programme on Managing Rural Development" from 20th August to 14 September in 1990 and 19th August to 13th September in 1991. This course is for Rural Development Planners and Managers.

For further information contact :

The Director
Continuing Education Centre
Asian Institute of Technology
G.P.O. Box - 2757
Bangkok - Thailand

ENVIRONMENTAL IMPACT ASSESSMENT

Centre for Environmental Management and Planning (CEMP) is holding its 11th International Seminar on Environmental Impact Assessment" at the University of Aberdeeen from July 8 to 11, 1990. It is being sponsored by the World Health Organization and the United Nations Development Programme.

For further information contact.
Centre for Environmental Management and Planning (CEMP)
48, College Bounds,
Old Aberdeen AB9 IFX,
Scotland.
U.K.

Deaths from diarrhoea : hope for the future

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Rural Technology Journal
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Allahabad - 211002. (INDIA)

The advance payment for advertisement should be made through a Bank Draft drawn in favour of "I.E.R.T.- Commercial Activity A/c" and sent along with the advertisement matter on the above mentioned address.

LOCAL HEALTH TRADITIONS: An Introduction

The technical monographs published by Lok Swasthrya Prampara Samvadhan Samiti explains the scientific principles underlying various health traditions. This book is divided in four chapters and two indexes in which the scope and extent of local health traditions and scientific basis of Indian systems of medicine has been discussed. Glossary of Technical terms refers to the terminology used in the medicine field and names of various books on Ayurveda and source has been listed in Appendix.

This book is very informative for local health practitioners and Community health workers and medical professionals. The effort is quite appreciable and it will play a role in bridging gap between medical field and Commonpeople.

Local Health Traditions : An Introcution by A.V. Balasubramaniam and Vaidya M. Radhika June '89. Published by Lok Swasthya Parampara Samvadhan Samiti C/o P.P.S.T. Foundation No. 6, Secondcross Street, Karpagam Gardens Adyar Madras - 600020. Price Rs. 25.00 per copy (Rs. 20.00 for members of Lok Swasthya Parampara Samvadhan Samiti).

BHARTIYA KHETI KE PUNARUTTHAN KEE DISHA

This publication explains various agricultural systems and cultivations and the harmful effect of modern cultivation methods. Author has explained the remedies for harmful effect, and also discussed about SENDRIYA KHAD which shows very good results in modern agricultural developments. The effect of insecticides on crops and effect of chemical fertilisers on fertility of land dealt in appendix. Dates of agricultural systems are also been dealt in appendix.

This book is Written on the basis of practical experience of authors. Case study of PALRI Village has also been dealt in this book.

The book is very informative for agriculturists, farmers, Scientists and researchers.

Your may obtain this book from.

Prof. Padma Vasudevan
Centre for Rural Development and Appropriate Technology,
Indian Institute cf Technology.
Hauz Khas,
NEW DELHI.

FOREST LAND FOR THE PEOPLE

The publication is series of Case Studies of FAO - Assisted Community forestry projects. The case study is based on the Work of Jacques Amyot of Chulalongkorn University Social Research Institute Bangkok - Swedish International Development Agency has Contributed a lot, in for case study work.

This provides information about projects/programmes through which rural people have developed forest resources to tackle local problems and meet local needs. This information may be useful for researchers and people involved in rural development , development planners and foresters in Thailand as a means of helping these national experts evaluate the results of their efforts in this area.

You may obtain, Copy of book from : :

Regional Forestry offiecer,
FAO Regional office for Asia and Pacific,
Maliwan Mansion,
Phra Atrt Road,
Bangkok
THAILAND.

DIRECTORY OF TECHNOLOGY PROMOTIONS INSTITUTIONS IN ASIA AND PACIFIC

This directory provides information networking in the region and facilities the promotion of technology utilisation. This may be helpful as a reference material as well as useful and effective interaction among technology promotion institutions enterprenurs and may be useful for people engaged in Rual Technology extension work.

Copy of Directory can be had from

Officer Incharge
Asian and Pacific centre for Transfer of Technology, 49 Palace Road, BANGALORE.

Lung cancer -- nonsmokers at risk

An hour a day in a room with a smoker is nearly a hundred times more likely to cause lung cancer in a nonsmoker than twenty years spent in a building containing asbestos.

RURAL TECHNOLOGY JOURNAL

Aims & Scope :

Rural Technology Journal is published by Information Services Division, Centre for Development of Rural Technology, Institute of Engineering & Rural Technology, Allahabad (India). The purpose of the Journal is to provide a forum for exchange of views, information and create awareness in the field of Rural Technology, its, development and transfer to the rural areas, technological products and processes, methodologies and approaches etc. Effort is being made to ensure that this Journal become relevant not only for this country but to all those nations, groups and individuals, in any part of the Globe who have concern to contribute towards the welfare of the under privileged rural communites. The Journal is divided into following main sections :

1.	Portfolio	—	(Articles/Papers)
2.	Tool Box	—	(Information on Rural Technology/Processes)
3.	Spot Light	—	(News and Views)
4.	Futurama	—	(Forthcoming Events : Training Programmes, Seminars, Symposium, Workshop etc.)
5.	Book Bag	—	(News on Books and Publications).

Note for the guidance of authors :

Papers/articles information packages, technical queries and related materials are cordially solicited. Manuscripts should be sent to :

The Editor
Rural Technology Journal
Information Services Division
Centre for Development of Rural Technology
Institute of Engineering and Rural Technology
26, Chatham Lines, Allahabad - 211002 (INDIA)

There is no limit to the length of contribution but it is suggested that a maximum of 6000 words or equivalent be used as a guide (approximately 6 to 7 pages).

1. The complete manuscript should be written in English and the desired order contents of Title, Abstract, List of symbols, Main Text, Acknowledgement, Reference and Appendices. The Standard Inter-national System of Units (SI) should be used.
2. The manuscript should be typed on one side of the paper only (preferably 8" x 11" bond paper) with double spacing between lines and 1½" margin on the left.
3. Two copies of the manuscript and illustrations (one set original) should be sent to the Editor .
4. The title should be brief (maximum of 150 characters including blank in between words or other non-alphabetical characters) and followed by the author's name, affiliation and address.
5. Internationally accepted standard symbols should be used. In the list of symbols Roman letters should precede lower case.
6. Graphs, charts, drawing sketches and diagrams should be black and white prints on glossy paper and preferably 3½ " x 7" size.
7. Illustrations should be numbered consecutively, given proper legends and should be attached at the end of the manuscript.

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